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MACKENZIE VALLEY PIPELINE INQUIRY

Government  
Publications

IN THE MATTER OF APPLICATIONS BY EACH OF

- (a) CANADIAN ARCTIC GAS PIPELINE LIMITED FOR A RIGHT-OF-WAY THAT MIGHT BE GRANTED ACROSS CROWN LANDS WITHIN THE YUKON TERRITORY AND THE NORTHWEST TERRITORIES; AND
- (b) FOOTHILLS PIPE LINES LTD. FOR A RIGHT-OF-WAY THAT MIGHT BE GRANTED ACROSS CROWN LANDS WITHIN THE NORTHWEST TERRITORIES,

FOR THE PURPOSE OF A PROPOSED MACKENZIE VALLEY PIPELINE

and

IN THE MATTER OF THE SOCIAL, ENVIRONMENTAL AND ECONOMIC IMPACT REGIONALLY OF THE CONSTRUCTION, OPERATION AND SUBSEQUENT ABANDONMENT OF THE ABOVE PROPOSED PIPELINE

(Before the Honourable Mr. Justice Berger, Commissioner)

Inuvik, N.W.T.

January 27, 1976.

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PROCEEDINGS AT INQUIRY

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Volume 118

CANADIAN ARCTIC  
GAS STUDY LTD.

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APPEARANCES:

Mr. Ian G. Scott, Q.C.,  
Mr. Stephen T. Goudge,  
Mr. Alick Ryder and  
Mr. Ian Roland for Mackenzie Valley Pipeline  
Inquiry;

Mr. Pierre Genest, Q.C.,  
Mr. Jack Marshall, and  
Mr. Darryl Carter for Canadian Arctic Gas  
Pipeline Limited;  
Mr. Reginald Gibbs, Q.C.,  
Mr. Alan Hollingworth &  
Mr. John W. Lutes, for Foothills Pipe Lines Ltd.;

Mr. Russell Anthony &  
Pro. Alastair Lucas for Canadian Arctic Resources  
Mr. Garth Evans Committee;

Mr. Glen W. Bell and  
Mr. Gerry Sutton, for Northwest Territories  
Indian Brotherhood, and  
Metis Association of the  
Northwest Territories;

Mr. John Bayly  
or  
Miss Leslie Lane for Inuit Tapirisat of Canada,  
and The Committee for  
Original Peoples Entitle-  
ment;

Mr. Ron Veale and  
Mr. Allen Lueck for The Council for the Yukon  
Indians;

Mr. Carson H. Templeton, for Environment Protection  
Board;

Mr. David Reesor for Northwest Territories  
Association of Municipal-  
ities;

Mr. Murray Sigler for Northwest Territories  
Chamber of Commerce.

Mr. John Ballem, Q.C., for Producer Companys;

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Inuvik, N.W.T.

January 27, 1970.

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

MR. GOUDGE: Sir, as we begin this morning I've been told that it froze in the east, and that has caused those who carry on in the east some difficulty; as we begin this morning, it's 66 below.

THE COMMISSIONER: Well, we're hardy here in the north. The easterners, we can't even allow comparisons to be made under the circumstances.

MR. BAYLY: Mr. Commissioner, before I begin to cross-examine I've distributed for the participants and left for filing with Miss Hutchinson the evidence of Mr. J.A. Percy, Mr. Thomas G. Smith, and the list of reports to be appended to the evidence of Arthur Martell.

THE COMMISSIONER: I think I should say that we will sit until Friday afternoon and we will adjourn Friday afternoon at 4 P.M. to allow the Court reporters and the Inquiry staff to put all the exhibits and equipment away, and to allow everyone to get the plane whenever it goes. So we'll stop at four on Friday.

MR. BAYLY: Mr. Commissioner, one further matter. In an effort to follow up some of the studies that Dr. Hobart conducted, C.O.P.E. attempted to obtain some statistics from the Royal Canadian Mounted Police and was unsuccessful, and





Sider, Tod, Wopnford  
Cross-Exam by Bayly

I have two letters, one to and one from the Mounted Police, "G" Division, and I would request the assistance of your staff, sir, if they may be in a better position to get this material than I have been. I think it would be useful to the Inquiry. We were interested in the statistics for the year following the study that Dr. Hobart did; his statistics cease at 1974.

THE COMMISSIONER: Will you get those?

MR. GOUDGE: I'll be glad to confer with Mr. Bayly at the break, sir, to determine how we should proceed.

BRUCE NEALE SIDER,  
JAMES FRANCIS TOD,  
MAX EUGENE WOPNFORD, resumed:

CROSS-EXAMINATION BY MR. BAYLY (CONTINUED):

Q Gentlemen, if we can proceed with your evidence at page 4 -- actually it's on 4 and 5, and it refers to separating the work forces from the communities and I'm assuming that you have conferred with the unions to see if they're agreeable to the arrangements that you propose for bringing workers directly on-site and shipping them directly out <sup>to the</sup> south; or is that something that has

WITNESS SIDER: No, discussions have not taken place with specific unions at this point in time, Mr. Bayly, as far as our company is concerned. I wouldn't anticipate that we would have





Sider, Tod, Wopenford  
Cross-Exam by Bayly

any problems in that type of discussion.

Q And when you say you haven't talked to any unions in particular, have you been talking with the Canadian Labour Congress or the unions in general?

A It's my understanding that the representatives of the Canadian Labour Congress have made representation to the head offices of each of the producers and there has been some preliminary discussion. Beyond that I'm not aware of any other discussions.

Q Have you studied the situation in Alaska to see what problems the management faced with the rules that they sought to impose upon the workers there?

A I personally have not studied in detail the Alaskan problem related to the transportation of personnel, no sir.

Q Because as I understand, the Alyeska Company started out with the same sort of proposals with regard to shipping workers in and out, as well as with regard to allowing certain activities and items in the camps. They had originally, as I understand, forbidden liquor and guns and women and were not successful in persuading the unions that these rules should be upheld.

A I don't think that there would be any question that we probably all have learned and are continuing to learn many things of what possibly to do, and what possibly not to do, should the



construction proceed as we see it at the present time,  
when comparing it to Alaska.

Q But you don't know  
whether you'll be able to avoid some of these problems  
even though you are now learning about them.

A I can only say I think  
we're confident that we can.

Q Now, in Volume 6 of your  
socio-economic impact assessment at page 37, refer  
at the top of the page to the changes that you would  
anticipate occurring in Tuktoyaktuk. You say that:

"Tuktoyaktuk would expand largely as a result  
of its role in transportation and through  
increases of income of residents who took  
advantage of employment opportunities."

Now, you've also said in your evidence that with  
respect to communities, the producers' plans are  
sufficiently flexible to permit some control over the  
degree and rate of impact. Have you gone to the  
settlement of Tuktoyaktuk to see how flexible they  
want you to be in determining the rate of growth that  
they may find that is imposed upon them?

A We haven't specifically  
spoken in terms of degrees of flexibility, Mr. Bayly.  
I don't think our plans have been far enough along  
that we could get that specific. We certainly have  
had discussions, and when I say "we", I'm talking about  
the producers collectively, have had discussions  
in Tuktoyaktuk. Also one of the producers as you  
are aware is on a continuous basis having discussions





Sider, Tod, Wopnford  
Cross-Exam by Bayly

with the council of Tuk.

Q Well, as I understand from page 37 of Volume 6, you've already made at least the fundamental part of the decision that Tuktoyaktuk would expand largely.

A I would think that one needs to read the entire sentence,

"would expand largely as a result of its role."  
I don't think the emphasis is on "largely".

Q Maybe we should omit "largely" and say that,

"it would expand as a result of its role in transportation."

A I'm comfortable with that, if you are, sir.

10 Q Well, I'm a little uncomfortable still because the size that it will grow to will depend largely on the plans that you have to increase the transportation facilities there, I would suggest.

A "Largely" expand, Mr. Bayly?

Q Well, let's not play with the word "largely"; but that is the situation, that we don't know what your plans are and yet you have made a statement forecasting growth of the community and I would suggest to you that that community would like to know what plans you do have for it.

A Well, I would suggest





Sider, Tod, Wopnford  
Cross-Exam by Bayly

that there is no question that we have to continue as we have in the past and certainly place more emphasis on discussions with the community of Tuk, and other delta communities.

Q In the event that the people of Tuk were to say to you that they didn't want to expand and become a transportation centre, if we can call it that, do you have any alternatives?

WITNESS TOD:

A Yes, we do, in that we were looking into the form of transportation, for instance on barges, and the harbour facilities there, our artificial islands that we have built in the Beaufort Sea can be used as a good source of harbour, and so on that basis we have some alternate ways in which we can go.

Q We've heard some evidence before the Commission that the Tuktoyaktuk Harbour would be quite unsuitable as a deep water harbour, in any event. Are you aware of that, sir?

A No, this Committee hasn't looked into the physical facilities of the Tuk Harbour, and we can't comment on what would have to be done for it.

Q As I understand there's a government report which says that really the only suitable deep water harbour on the entire coast is at Babbage Bay, and are you aware of that, sir?

A No sir.

Q But you'd want to know about those things before you made your -- made up





Sider, Tod, Wopnford.  
Cross-Exam by Bayly

your shipping logistics.

WITNESS SIDER: I would think, Mr. Bayly, that those kinds of concerns and those areas of expertise lie within a group other than this panel.

Q You'd be willing, though, to meet with them to tell them what you think the Tuktoyaktuk people feel about expanding as a transportation centre?

A Yes, if we were aware of what the Tuk people, what their views were, yes, we would very much pass those along to that group.

Q Would you propose to find this out firsthand, or would you propose to request that the government do that for you?

WITNESS WOPNFORD: Maybe we should just back up here a minute. I don't recall the producers suggesting that they required a deep water harbour for our particular operations. I believe it's other people that are involved in that.

Q Mr. Wopnford, this is your volume, this Volume 6, as I understand. It's got the name of your company on it, and it says that Tuktoyaktuk would expand largely as a result of its role in transportation and through increases of income of residents who took advantage of employment opportunities. Maybe your company doesn't mean that.

A No, that isn't what I said. I believe that you -- I thought you were relating this to a deep water harbour.

Q Well, perhaps you can





Sider, Tod, Wopnford  
Cross-Exam by Bayly

tell me then what transportation plans Shell has for Tuktoyaktuk. I had assumed it was a deep water harbour and it may be something quite different.

A Well, my understanding is that it could well be used as a lightering base for some equipment that may come around from Vancouver, but not for deep water, not necessarily deep water ships.

Q So you would contemplate it being used perhaps for ocean barges, ocean-going barges.

A Yes.

Q And have you investigated the harbour to determine whether you would require dredging from time to time to get ocean-going barges in and out of the harbour?

A I don't believe that the producers would require the dredging for any of the work that they contemplate.

Q All right, and you wouldn't know because you're not in that part of the operation, whether any studies have been done to see whether you'd have to dredge to get ocean-going barges in?

A No.

Q On page 6 of your evidence you have stated in the second full paragraph that,

"The impact on present services such as transportation and communications should result in a continual upgrading of these services to





Sider, Tod, Wopnford  
Cross-Exam by Bayly

1 meet the demands."

2 A What page is it?

3 Q Page 6, second full  
4 paragraph.

5 A Of our evidence, or of  
6 the responses?

7 Q Of your evidence.

8 WITNESS SIDER:

9 A I'm sorry, Mr. Bayly,  
10 our page 6 seems to be different.

11 Q Different from each  
12 other's or --

13 A Oh, this is on the  
14 direct evidence?

15 Q Yes.

16 A Thank you.

17 Q Page number --

18 A Yes, thank you.

19 Q Now, as I understand  
20 there is a possibility that some of the problems of  
21 Alaska may arrive on the doorstep of the Mackenzie  
22 Delta and are you confident that the up-grading of the  
23 services, as you have stated in this paragraph, will  
24 not be outstripped by the demand on them of various  
25 facilities that are planned to go in all at the same  
26 time?

27 WITNESS WOPNFORD: We had so  
28 much trouble finding the page there I'm not sure of  
29 the paragraph.

30 Q All right, we're on  
page 6.

WITNESS SIDER:

A Yes. We're a little









Sider, Tod, Wopnford  
Cross-Exam by Bayly

planning can be sufficiently advanced that it would be able to capably handle the increased requirement in those areas.

Q All right, but you don't feel that the planning of that is your affair?

A No sir.

Q All right, but in order for other people to plan around you, would you not agree that you have to tell them what you're going to do in sufficient detail that they can plan for the need for expanded facilities?

A Well, my personal assumption would be that having filed our application with the government, that we haven't had any indications at this point in time that it has not been in sufficient detail as related to those matters. To my personal knowledge, we haven't had any further requests that would be related to upgrading of those particular items.

WITNESS TOD: Mr. Bayly, I think I'd like to add a comment to that in that for instance in the case of telephone facilities there has been information passed to the common carriers with which they can start their long-range planning. It is very preliminary, but it is at a stage where they can use it and can proceed to determine what the requirements are going to be, not only for our industry but for the local area as well. So I think that's just an example of what we are doing and are planning to do, even though we have not concluded all of the





Sider, Tod, Wopnford  
Cross-Exam by Bayly

negotiations or all of the contacts.

Q Who's going to pay for all these expansions, have you thought about that? Is it going to cost us more in the Northwest Territories for airplane fares and trunk telephone calls because the facilities have been expanded because of your project and others?

A I think that the answer to that lies in the normal usage and the effect of volume and what it does to the cost of various commodities. I think for instance in the case of telephone facilities that it will not cause an increase any more than the regular increase that you would see for normal operations. I think that the increased volume will allow the services and the cost of the individual item to, if anything, level off rather than to escalate as fast as what it has in the past.

Q Have the telephone companies told you that they agree with that?

A No, we haven't discussed dollars with them. As I suggested to you, we are in the preliminary stages, giving them an indication of what our requirements are going to be so they can do their planning.

Q And with regard to increased demands on charter aircraft?

A We haven't been in contact with charter people at this point in time because we haven't got our volumes to the point where we can make adequate predictions.





Sider, Tod, Wopnford  
C ross-Exam by Bayly

Q Well, have you studied what went on in Alaska when there was a very great demand on the charter airplane business?

A I have not.

Q And would you be doing that?

A I would expect that our transportation people will be looking into this, yes.

Q Would you contemplate supplying your own airplane transportation with company aircraft rather than chartered aircraft?

A There is no doubt that we'll be using our own company aircraft to some degree, but what that degree is at this point in time I'm not in any position to answer.

Q You referred on page 5 to a small number of company personnel living in Inuvik. Can you give us some numbers? It's in the bottom of page 5, last paragraph.

A Yes, pardon me. We have looked at the possibility of people coming into Inuvik in the range of three to five people is what we're looking at. That is per company.

Q So that's 15 people for the three companies, you would anticipate.

A That is an approximation at this time and is based on the activities that we can see up until three or four years down the road.

Q And are these people



that -- would these all be bachelors, or will we expect that each one will require a house or a trailer?

A I'm sorry, Mr. Bayly, we haven't picked the people and it's pretty difficult to tell what they will be.

Q And would you plan to build your own housing for them, or move into existing housing either renting it or purchasing it?

A This is an area that we are looking into at the present time and have not concluded our plans.

Q You're aware that housing is in fairly short supply in Inuvik?

A We're well aware of that and we're looking to see what is the best way of handling it.

Q Now, coupled with your 15 people moving in, you contemplate a number of service industries moving personnel in and requiring housing and presumably office and warehouse, etc., kinds of space. Have you projected the numbers of service people that would move into Inuvik as a result of your development?

WITNESS SIDER:

A I would hope, Mr. Bayly, that the study that we alluded to yesterday, that is currently under way by Van Ginkel Associates, which is essentially a study on three main communities with particular emphasis of course as far as we are concerned on Inuvik, will provide us with the kind of information that will give us better direction and





1 help our decision-making in terms of what housing and  
2 what type of housing, what subsidy requirements, if  
3 any, will be required. So therefore we're awaiting the  
4 study before we proceed too much further.

5 Q Now you've said in  
6 Volume 6 of your socio-economic assessment with regard  
7 to Inuvik in the second paragraph that,

8 "Inuvik's problems would run the gamut of  
9 physical, social and economic."

10 I wonder if you could explain that?

11 WITNESS TOD:  
What page, sir?

12 Q Page 36. You go on in  
13 that paragraph to say that,

14 "Utilidor service is very expensive, especially  
15 with the present low density layout. Native  
16 housing generally is not connected to the  
17 utilidor. If the town were to continue expanding  
18 new means would have to be found to pay for  
19 services so that all sectors of the community  
20 could benefit."

21 And then you refer to,

22 "Inflow capital from the pipeline and other  
23 related developments improving the prospects  
24 of obtaining the necessary financing."

25 Now let's start at the beginning, with the gamut of  
26 physical, social, and economic problems that you would  
27 anticipate. Have you outlined what those are likely  
28 to be?

29 WITNESS WOPNFORD: With respect  
to the physical and the economic, again I would



1 suggest that we await the results of the Van Ginkel  
2 study. He is doing a site specific study on what their  
3 estimate is of how further planning could go on.

4 Q And Shell is going to be  
5 relying on Van Ginkel at a later stage.

6 A Well, not entirely, but  
7 we are, along with Arctic Gas, have commissioned this  
8 study with respect to the housing and the infra-structure  
9 for Inuvik, yes.

10 Q So those are the physical  
11 problems you see with regard to housing.

12 A Yes, and at least  
13 partially the economic, if this specific sentence  
14 refers to the economics of the community, the tax  
15 base and so on, I believe that he's -- I can't confirm  
16 this exactly but I believe that he's also looking at  
17 that. I also understand the tax base here is rather  
18 difficult at the time, that there are some real problems  
19 with taxation.

20 Q So not all of the  
21 economic things that this project will be will be  
22 benefits, there may be real strains on the tax  
23 base and the ability to provide services to those  
24 people coming in to a centre line Inuvik, in your  
25 opinion?

26 A Well no, we have assumed  
27 that it will probably improve the tax base in terms  
28 of expanding it, both in the way of pipeline facilities  
29 and additional housing that may or may not be provided  
30 by the companies entering the tax rolls here.





Q But a lot of the people that come in as a result of your development, even if they're not with your company, may put real strains on the existing housing. They may not be in a position to buy a house, they may move into an existing one or move in with somebody else in one. Do you agree that that's a good possibility?

A That could happen.

Q And there may be quite a good deal of crowding and that's not going to increase the tax base.

A If it's not properly planned I think that could happen. I think we have enough time to do proper planning.

WITNESS SIDER: I think also one of the points that we have attempted to suggest to you, Mr. Bayly, is that as far as the producers are concerned, particularly in terms of moving people into the Territories, the speed at which that can take place can be dependent to a large measure on the capabilities of for instance INuvik to absorb employees of Gulf, Imperial or Shell, and agreement to do that will only come after a great deal of conversation with the Town of Inuvik. Certainly it would be our intention that come the time when people will move in, and my own personal view is that hopefully that will take place, that it will be a positive thing for the Town of Inuvik. It's not our intent to be detrimental to the Community of Inuvik.

Q I understand that, and



you appreciate, though, that everybody from the man who sells drilling mugs to the man who sells colored pots and pans will move in following your development.

A There is no question that it would appear that there are some problems at the present time in Inuvik, and without a great deal of planning and co-operation between government, industry, local government and the people, it could be a bad situation. But I think with careful planning, with dialogue, I see no reason why it can't proceed in an orderly and beneficial way.

Q Well, I think there's a third element, isn't there, apart from planning and dialogue, it takes quite a lot of money to provide the services to keep up with development that comes in, which is as large as yours and the ones that are related to it?

A No question of it.

Q All right. We can't look at your development in isolation. If you build, the pipeline will be built and Inuvik will be looking at far more impacts than you are prepared perhaps to look at, at this point. Have you thought of whether or not industry is willing to make a commitment to a town like Inuvik to assist in the providing of services?

A I don't think we would be in a position to be able to answer that one way or the other at this point in time. We haven't sufficiently studied the situation to be able to give a clear or concise answer.





Sider, Tod, Wopnford  
Cross-Exam by Bayly

Q Did you study what happened in Valdez to the municipal services in that town when the Alyeska staging was largely done at that site?

A Certainly we have not studied it.

Q And do you have any plans to do so?

A Specifically Valdez? Perhaps, you know, I can't verify that we're going to go out and study the Valdez report and --

Q The reason I suggest that, Mr. Sider, is the settlement, as I understand it, put in a new sewage system to get ready for the influx of people and it just wasn't big enough, and it overloaded, which meant building an additional new one. These are the sorts of things that communities may face, I suggest to you, and should be studied by industry as well as government.

A I would agree. I think that industry should participate in those studies.

Q Now, you've talked as well about social problems in this gamut of problems, and what social problems have you identified that you would say would be particular to Inuvik, which you have singled out?

A Oh, I think perhaps maybe we should talk more in terms of social amenities rather than just social.

Q So you're saying that









1 one of the problems would be that there would be more  
2 social amenities.

3 A I would hope so. I think  
4 those frequently go along with the development of  
5 a town.

6 Q Mr. Sider, let's have a  
7 look at this sentence again. O.K.?

8 "Inuvik's problems would run the gamut of the  
9 physical, social and economic."

10 I suggest to you that a social amenity is not likely  
11 to be a social problem and there may be -- maybe you  
12 didn't think of anything except for social amenities,  
13 but you wrote it as though they were problems. Let  
14 me refer you to Gemini North's Report and perhaps this  
15 will help you out. At page 74 of book 3 of the social  
16 and economic impacts of the proposed Arctic Gas Pipe-  
17 line in Northern Canada, page 74,

18 "The oil patch boom hit Inuvik in 1968 and the  
19 community has been expanding ever since. The  
20 boom has been accompanied by an increase in  
21 alcohol consumption, crimes of violence, family  
22 unit breakdown, racial tension, and other social  
23 problems which are dealt with in another section  
24 of this report."

25 Was that the gamut you were referring to?

26 A Yes, but you know,  
27 certainly we don't have any firm fix on levels in  
28 those areas.

29 Q But you're suggesting that  
30 Inuvik is in for more of the same.



A It could possibly, without proper planning.

Q Now, you've suggested in this report that it would happen and you've identified the problems but you haven't suggested how proper planning would help this out. Are you going to get into the proper planning business with the government to help alleviate these problems?

A Well, we don't have the answers but we'd be delighted if you did. I simply say that we're in the learning process, Mr. Bayly. We'd be happy to contribute any knowledge that we might have, and we would look to anyone else that would be able to contribute.

Q All right, but one of the dangers of the learning process is -- and I ask you to agree or disagree with me -- is that Inuvik may become a laboratory for it?

A I wouldn't suggest that, but --

Q All right, you've talked about in this report of the next paragraph:

"The population of Inuvik could be expected to double in the next decade if the pipeline is constructed."

That would be your forecast of the possible expansion?

A I think that's a possibility, yes.

Q And you've said later on that,





Sider, Tod, Wopnford  
Cross-Exam by Bayly

"The alternatives appear to be to develop a new Town Centre and high density residential core on the present site, utilizing the existing gravel base, and build up through it on deep piles or to continue the current low density development."

So you see the possibility of Inuvik going high-rise.

A Well, I think not necessarily high-rise, but I think that at the time that we prepared that report, I think that generally did represent our collective views on what Inuvik may possibly look like.

Q Well, did you discuss -- go ahead.

A Sorry. I think that at this point of time hopefully with complete open minds we would like now to take a look at the report that will be coming. We may continue to hold the same view. On the other hand, it may offer a better alternative.

Q Have you spoken to the Town Council of Inuvik and let them know what your views on the problems they may face are, as well as the benefits that they might derive?

A My hesitancy there was to attempt to identify whether we have in fact talked with the whole Town Council, or has it been on an individual basis. There have been discussions with the Town Council in general terms /<sup>about</sup> the development, Mr. Bayly; in terms of specific development of Inuvik, I'm not aware of any specific discussions.



Sider, Tod, Wopnford  
Cross-Exam by Bayly

Q All right. Well, as you know, the Town Council has in general terms embraced the project, and what I want to know is if they appreciate that it will bring problems that run the gamut that you've described, as well as benefits?

A Well, I 'm sure the competence of the Town Council here would have provided that type of thinking.

Q At page 5 in your evidence -- I'll go onto another point while we're finding that one. You said in Volume 6 at page 38 with regard to native use of resources, that you anticipate using 750 acres at present. That's in the third full paragraph.

WITNESS WOPNFORD:  
Thank you.

Q And I gather what you mean by that is not that your projects as shown on the material that you filed with your evidence here this past week or so, but the actual land taken for roads, pads, etc.

A I believe the -- I can't recall the testimony now from a few days ago -- I think it was slightly higher than 750.

Q That was my understanding

yes.

A I don't recall it.  
It's likely an upgrading of what we did here several months ago.

Q At least one of the projects, as I recall, was 1,000 acres.





Sider, Tod, Wopnford  
Cross-Exam by Bayly

A I believe that's correct.  
They're the impacted areas.

WITNESS TOD: But out of that  
1,000 acres only I think it's in the order of a couple  
of hundred that are actually used, the rest are still  
in its natural state, so therefore it would not be  
added into the total as listed here on this page.

Q Now, that's what I was  
concerned with. Perhaps this 750 refers to where you  
actually have your facilities on the --

WITNESS WOPNFORD:

A Well, we have also had  
some changes in plans since this was written, so  
I'm sure that 750 is an order of magnitude figure,  
but it's not --

Q Well, perhaps when  
they thought that it would be able to drill from a  
cluster system --

A Yes.

Q -- less land was in-  
volved.

A That is correct.

Q Now you've said that  
this won't adversely affect trapping and hunting  
by taking this quantity of land out of production,  
if you will, of wild animals and fur-bearing animals.  
This doesn't refer to the possibility of other finds  
throughout the basin, I take it? You're really only  
confining your self to the three projects that  
are presently applied for.

A That is correct, but we



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do have from Mr. Webb's testimony, of course, some larger areas of study and he has indicated some areas that would be critical in terms of taking it out of the normal production, and other areas that are not. I think the only way that sort of thing could be handled is to watch the site specific plans as they develop and get some reading from our biological consultants to make certain we don't impact on these areas.

Q We've heard evidence recently from your companies that if you found sour gas that you'd find a way to produce it rather than capping it and saying, "Because of the environment we don't want to risk producing this gas."

Are the concerns or the realities of your project, that if you found gas that had to be drilled in a critical area, that you would go ahead?

A I think we would have to get an assessment. The question simply can't be answered, I don't believe, until you know the amount of impact, what are the tradeoffs on it, and what the government and others think of that particular development in that particular place.

Q Would the tradeoffs involve how much gas <sup>there</sup> ~~was~~ there as opposed to how many birds or how many foxes?

A I'm sorry, I just couldn't answer that until we knew the specific circumstances.

Q You'd have to assess it





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from a --

MR. BALLEM: Excuse me, Mr. Bayly. Are we not straying back to another panel? It seems to me we're exploring the environmental aspects again.

MR. BAYLY: Well, Mr. Commissioner, it's difficult to separate the people from the land sometimes, and this panel has talked about trapping and hunting, and people trap foxes and hunt birds. As I say, it's difficult not to discuss one when discussing the other. I don't want to discuss where the areas that may be critical are. I want to know what kinds of social considerations this panel would make in recommending whether or not to go into an area which might be critical to one of the animals relied on by any of the peoples in order to establish a new facility.

THE COMMISSIONER: Do you want to know whether they would go into such an area?

MR. BAYLY: Yes, and they've said they can't say, so I'm content to leave it there.

THE COMMISSIONER: Well, if there were large volumes of oil and gas there, they would probably want to go into it.

MR. BAYLY: That was my impression, sir. We were in the question of how you trade these things off, and this may be a matter for policy panels rather than for these gentlemen.

Q Now, at page 4 of your evidence you said that your activities will not hamper



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traditional activities. Have you looked into whether or not your project is going to cause or contribute to causing inflation locally, that it may make the cost of equipment that is not related to your project go up to put it out of the reach of people who would carry on traditional pursuits?

WITNESS WOPNFORD:

A We have certainly discussed that particular problem, Mr. Bayly. We can't have a particular solution for those impacts caused other than by, say, the producers; but being aware of the problem, we feel that we can maintain it by drawing more or less on the local services or local goods, and so in effect, not be in competition with the local people if that situation starts to arise.

Q Now that is something that I've been curious about. As I understand, there haven't been any large developments in this part of the north where the companies have relied on locally purchased goods, say food. They've brought their own food in.

WITNESS TOD:

A I think that we have experienced that today, that we are purchasing food locally now.

Q All right, but in the past you'd agree with me that this has not been the case.

A Well, what's the past?

Q Well, you tell me what the past is, Mr. Tod. As I understand it, into the Dew Line sites the food was shipped directly from the



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south, it wasn't bought at the local Hudson's Bay Store.  
Would you agree with me there, sir?

A We haven't investigated  
the Dew Line. I'm suggesting that what we have investi-  
gated is our own experience over the last number of  
years.

Q All right, do you ship  
fresh food in now to your drilling camps?

A No sir, we buy our food  
locally.

Q All right, you buy every-  
thing locally, do you?

A I beg your pardon?

Q You buy all the food  
locally, do you?

A Pretty well all of the  
food, yes.

Q Some of the fresh food  
you bring in directly from the south?

A Not to my knowledge.

Q Do you buy from local  
people selling fish and reindeer meat as well, to  
supply your camps?

A Yes, we do buy.

Q Now, we have a state-  
ment in Volume 6 at page 25 with regard to native  
use of resources and it comes from the Gemini North  
Report. It says that:

" Canadian Arctic Gas estimates a total of  
139 trappers in the delta, 31 of them full-time,





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earning more than \$400 each in the 1972-73  
season."

Is your source Gemini North, or do you have a source  
of statistics that confirms that these are indeed  
accurate?

WITNESS WOPNFORD:

A I believe Gemini North  
is the source for that.

Q You haven't looked beyond that?

A I don't know.

MR. BAYLY: I have no further  
questions of this panel. Thank you gentlemen.

CROSS-EXAMINATION BY MR. GOUDGE:

Q Mr. Sider, let me begin  
by asking you a few questions that relate to the  
experience of your three companies in the past with  
both native and northern employment. Just to set the  
figures in context, how long in general terms have  
each of the three companies been operating in the  
delta so as to employ either natives or northerners?

WITNESS SIDER: Approximately  
11 years, Mr. Goudge.

Q And is that figure the  
same for each of the three companies?

A Relatively close.

Q And I take it at least  
over recent times, over the last two or three years  
one of the programs you've engaged in to encourage  
native or northern involvement is the Nortran program



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that we've heard quite a bit about.

A Yes sir.

Q I take it apart from that though, you have in addition employed natives or northerners in other facets of your operations in the delta.

A Yes sir.

Q Now, let me ask in my own way for some figures from you that may overlap with the figures that the Commissioner asked you for yesterday. Would you be able to supply us with present figures freezing the picture today to show number of natives presently in your employ for each of the three companies, breaking them down company by company in the delta?

A We could arrange to have a count made, yes.

WITNESS TOD: I have that information available, to me, if one company's information would help you.

Q Yes, it would, sir.

A As of about a week ago, which was the cut-off that I used, we had a total of 350 people in the delta or working in, not necessarily in the delta at that time but shall we call it on the delta payroll; and of that 350 people, 84, which is approximately 25%, were native people.

Q 84?

A 84. We do have more native people working for us than that. I'm talking in





Cross-Exam by Goudge

terms of what is -- those who are working right in the delta area. That excludes the Nortran people who are working in the south.

Q I see.

THE COMMISSIONER: What were the two figures again, 84 out of?

A 350.

Q Out of 350?

A That's right.

MR. GOUDGE: Q Mr. Tod, would that 350 include the offshore island work?

A Yes sir.

Q Mr. Sider, would you be able to supply equivalent figures for Gulf?

WITNESS SIDER: I would, sir.

Q And Mr. Wopnford for Shell, please?

WITNESS WOPNFORD: Yes.

THE COMMISSIONER: Bear in mind when you provide this information, I think Mr. Goudge's notion of breaking it down company by company is sound, but I would like the job categories.

WITNESS SIDER: I think we identified that yesterday, Mr. Commissioner.

THE COMMISSIONER: Yes, all right.

M R GOUDGE: And perhaps again with each of the figures the Commissioner asked for you would do it by company as well as in total.

A Yes.



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Q I'd be grateful. Mr.  
Tod, just to concentrate on your figures for a moment,  
can you tell me whether that 350 number is a number  
relating to permanent employment, or is that simply  
the number at the moment which may vary seasonally?

WITNESS TOD: That is a  
seasonal number.

Q Do you have a separate  
figure which relates to your year-around work force in  
the delta? If you don't --

A No,

Q -- could you give me a  
guess as to what the year-around figure is?

A Well, I guess my answer  
to that would be that we have oh, about 120, what I  
would consider permanent employees.

Q Yes sir.

A That basically work in  
the delta, and also do work outside.

Q And of that 120 would  
the same percentage be native?

A It would be in the range  
of maybe 20 to 25%.

Q So it's approximately  
the same percentage of your permanent work force.

A It would probably be  
maybe a little bit lower because of the increase in  
the use of casual people to bring us up to the 25%  
at this time.

Q And Mr. Sider and Mr.



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Wopnford, when you compile your figures would you as well, if possible indicate the permanent work force as opposed to the seasonal work force?

WITNESS SIDER: I could as far as Gulf and I would stand to be corrected and could clarify that in the letter, but I think that as I interpret regular or permanent employees we have quite a substantially less number than Imperial. Our total permanent work force in the delta would probably number around 10, of which 60% would be native.

Q Mr. Wopnford, do you have any comment on that, or would you prefer to review the figures?

WITNESS WOPNFORD: Well, I think we should review it. I would point out again that our work force are much smaller. I think we have something in the order of 125 or 30 people at the moment, in the delta.

Q Well, if you'd both be good enough to supply me with those figures I'd be grateful. Now, Mr. Sider, I understood from your comments relating to the Coppermine experience that that is a project that Gulf considers to have been successful, in broad general terms.

WITNESS SIDER: Extremely successful, sir.

Q And that Gulf has concentrated on getting a substantial proportion of its native and northern labor from Coppermine.

A Yes sir.





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Q And as I understood your reasoning, Gulf engaged in that because, if you will, the other labor pools were being tapped to capacity.

A Yes sir.

Q In particular, Tuk and Aklavik. Am I correct in that, sir?

A Yes sir.

Q And I understood you to say that Gulf felt it undesirable to get into what I might call a bidding war with present employers.

A Bidding war may be one terminology. We just didn't feel it was -- would be fair to be competitive for people who are already committed to other companies.

Q Yes, and I take it, Mr. Wopnford, Shell has felt the same way, and has begun at least to establish its own relationship in Fort McPherson, I think you said.

WITNESS WOPNFORD: Well, that relationship has been going on for some time. We more or less just formalized it in the last year or two.

Q But I think Shell's thinking in doing so is coincident with the thinking Mr. Sider described.

A Well, the competition was with ourselves. We do use Aklavik people, to some extent, and when we had a seismic crew here we were drawing on them substantially in the order of 30 or 40 people. So we simply ran out of people.

Q But you don't go to Tuk



to attempt to get your people because the people  
there are already fully employed, if you will, so far  
as there are those who want to be employed by Imperial

A Generally that's correct  
yes.

Q Mr. Sider, I'd like to  
ask you a little bit about the reasoning behind this.  
Is your reluctance to go into Tuk to use the Gulf-  
Imperial juxta position particularly, is  
that reluctance based on any fellow feeling for  
Imperial, or does it relate to what would happen to  
wage rates in Tuk if you went into Tuk?

WITNESS SIDER: We do have a  
feeling for Imperial.

(LAUGHTER)

THE COMMISSIONER: So do we  
all.

A I should just, you know,  
make it clear, Mr. Goudge, that we don't exclusively  
utilize Coppermine employees. We do have employees  
from Tuk. We do have employees from Inuvik. We do  
I believe still have some employees from Aklavik.  
So it's not totally exclusively Coppermine, it's  
simply that Coppermine had that manpower availability  
that to us was desirable and therefore we have con-  
tinued our drawing of manpower out of there. But we  
still utilize people, as I say, from these other delta  
communities.

MR. GOUDGE: Well, let me  
suggest to you, and perhaps you can agree or disagree,



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that if you did find yourself forced to compete against Imperial in Tuk, that the undesirable consequences would include social consequences, local inflation consequences, both of which would be damaging to both the companies and the community.

WITNESS WOPNFORD: I don't believe that the wage rates are fairly well set on what we pay. There's, you know, they're not exactly standard throughout the industry, but for instance a roughneck generally has the same pay rate, so I don't see it in that kind of competition, in terms that we would go in and offer more money to take some people. The alternative would be to find a roughneck at that rate elsewhere. So I don't --

Q But make the assumption with me, Mr. Wopnford, that you can't do that, there are no other sources for labor. You're forced to bid against your fellow companies for labor.

A I guess we'd take them from outside.

WITNESS SIDER : You know there is no fitting process that goes on, you'd be unfortunately recruiting more people from the south, that's all.

Q There would be no bidding process going on because the companies don't want to undergo the economic hardship that bidding would involve.

A Very much so.

Q I see. Would you see





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1 the bidding process to, as well, carry consequences for  
2 the community as well as for the company, and be un-  
3 desirable because of that as well?

4 A I think there certainly  
5 would be situations that would occur, yes. I don't  
6 think that would be a desirable tactic to engage in.

7 Q In other words, an over-  
8 strain on the local labor market is something that you  
9 companies want to avoid.

10 A Yes.

11 Q Because that overstrain  
12 causes economic and social consequences for the  
13 community and as well an economic hardship for the  
14 company.

15 A Yes.

16 Q And I suggest to you  
17 that that is one way of looking at your reasoning  
18 behind going to Coppermine.

19 A Partly, yes.

20 Q And I'd suggest to you  
21 as well that that reasoning will be reasoning with  
22 which you'll have to deal if development expands very  
23 substantially in the delta.

24 A I'm sure it will.

25 Q Now let me ask in  
26 terms of Coppermine, Mr. Sider, one or two questions  
27 arising out of Dr. Hobart's work. You're familiar with  
28 the four-phase approach that Dr. Hobart described  
29 Gulf as using in Coppermine.

30 A Yes.



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Q Are you, sir?

Just briefly, the first phase is consultation with other firms involved in native people employment programs; the second is consultation with people in Coppermine particularly the Settlement Council; the third phase is information provided to the settlement in a general meeting; and the fourth phase is pre-employment educational program conducted in Coppermine. I wonder if the other two companies have thought of engaging in similar phased approaches in dealing with their own local labor markets -- Mr. Wopnford?

WITNESS WOPNFORD: No, we have not done any of that.

Q Do you consider that phased approach to be desirable?

A I think it would be particularly desirable in a community where there hadn't been hiring over a longer period of time.

Q Why have you chosen not to engage in it, in your Fort McPherson relationship?

A Because that has been going on probably in an accelerated rate for 10 or 12 years, so there were people hired many years ago in the field of seismic work and it has been a continuing program of --

Q You see the utility of this approach only where there has been no prior experience with this kind of --



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A It certainly has the greatest benefit there, I think, yes.

Q Mr. Tod, what about you and Imperial and Tuk?

WITNESS TOD: I think the answer to your question is that while we haven't done it in a formalized manner the same as Gulf has, that our ongoing process of talking to the Town Councils, talking to employment officers, talking to the various people gives us kind of the same insight; but it hasn't been formalized and documented in the same degree.

Q And that's an approach that you have found useful in drawing on local employment?

A Very much so, yes.

Q Now, returning to you, Mr. Sider, Dr. Hobart, I'm sure you're familiar, raise the problem that presented itself to Gulf in Coppermine arising from the frequent lack of advance notice when workers were to return after a rotation and failed to give advance notice that they would not be returning. Would you categorize that as a problem of any gravity for the company's ongoing operational efficiency?

WITNESS SIDER: No, I don't believe so. I think that we have been effectively able to resolve that problem.

Q To live with it, or to resolve it?

A To resolve it to some degree, and to live with it to some degree because it





becomes a change of attitude, if you will, on the part of supervisors.

Q I see. For them it's a scheduling problem that they've found themselves able to accommodate.

A They've made adjustments and been able to overcome it. It certainly has created difficulties, but there's a change of attitude both on the part of Gulf personnel and a change of attitude on the part of our personnel out of Coppermine.

Q I wonder, Mr. Tod, if Imperial has had a similar experience in drawing on its labor force, say for example from Tuk?

WITNESS TOD: I think you would have to say that we normally are able to fill our requirements from the communities through the use of shall we say the local Employment Office or officer in Tuk, or for instance here in Inuvik we have an Employment Office which has three people in it, two of them are native people, that's employment and payroll; and these people have been able to solicit the number of people that we require and have them on-site as we need them.

Q But referring specifically to the problem of lack of notice for returning workers, is that a problem that Imperial has had experience with?

A It has caused concerns, yes, it has caused us some difficulties but we are normally able to pick up somebody to replace the



individual who did not show.

Q Yes. Mr. Wopnford,  
would Shell have had the same experience?

WITNESS WOPNFORD: Yes, we've  
had the same kind of problems.

Q It's a problem, though,  
that you have found soluble, one with which you've  
been able to live to some degree.

A Yes. I think, though,  
it's fair to say that the problem has been improving,  
that we have had less of it although in one -- even  
just this past week I was at the camp listening to them --

Q Sorry, I can't hear you.

A -- they needed a  
drilling crew or they needed some<sup>of the</sup> people for the  
drilling crew and they simply didn't show up without  
any notice, and it's very difficult to get those kinds  
of people. If it's somebody who's on a roustabout  
crew or straight labor, for instance, it's much easier  
to find someone to replace them; but once they get  
promoted onto the drilling crew, if you like, it  
does create a hardship, but generally we can -- somebody  
stays over for a couple of days until we find a  
replacement and so it's accommodative, all right, and  
it certainly is improving.

Q Mr. Sider, one of the  
other aspects of the Gulf operation in Coppermine  
that's related to this, and perhaps deserves atten-  
tion, is the use there of an expediter.

WITNESS SIDER: Yes sir.



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Q I take it that that is  
a term referring to a native resident of Coppermine?

A Yes sir.

Q And his task is to promote the flow of employees from Coppermine to the Gulf operation and back?

A Yes.

Q What has Gulf's experience been with length of term of service of the expediter? Has he been a long-term employee?

A We've had an expediter this is now into our fourth year. Our first expediter was with us for two years, and our current expediter replaced him and is still employed.

Q Do you have any views on the desirability of the expediter being a long-service or long-term employee?

A I have no views on whether, you know, on long-term employment. I might just say that having an expediter there has been invaluable as far as we're concerned in order to ensure that the shift schedules are met. He performs the service of not only identifying the individuals, particularly in those times when we're now expending our requirements and we decide we need two additional personnel, he because of his knowledge of the people within the community will normally make his recommendations and they're followed by the supervisors at Swimming Point. He certainly frequently takes the vehicle to the employee's home, if necessary wakes





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them up and makes sure that they're dressed and ready to go when the aircraft arrives, delivers all of the crew change out to the airstrip and then delivers the homecoming crew back to their homes. So it's a combined delivery system as far as the employees are concerned, and of course provides them with the very desirable advantage of having transportation directly to their home, plus he does, if you will, some selection of personnel for us that is much easier handled at Coppermine.

Q Does the expediter actually fill the job slots in the crew, that is does he designate which individual fill which job slots?

A Well, you know, one of the supervisors can call up and if he's simply talking about labor, there's no problem about that. We'll let the expediter identify who he feels should be qualified to come in; but if he's talking about an individual that's had experience in swamping, then he knows the people in Coppermine that have been out, as does normally the supervisor. But he more importantly he will know who is available to come at that point in time. But the thing that we're experiencing is that -- and I think that was indicated by Dr. Hobart -- that initially the number of shift changes that individuals would go through were considerably less than the number of shift changes that they now go through. In other words I'm saying that they're staying for much longer periods of time, and in fact many of the employees that we have <sup>out of</sup> Coppermine, a number of them are back to when



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we first entered into our agreement of employment out of Coppermine.

Q Mr. Tod, does Imperial have any experience with the use of an expediter?

WITNESS TOD: Yes. My term was employment, local employment officer, and the procedure that Bruce has just outlined is very similar in our case. We have these people located right here for instance, in Inuvik and the young gentleman has been with us. We've also had two employment officers in a similar period of time to what Bruce had alluded to. So our experience has been very similar to that which he just described.

Q Mr. Wopnford?

WITNESS WOPNFORD: We use the employment officer who is in Fort McPherson to supply the rotation that we use there.

Q You don't have your own employee there?

A No, he's employed by the -- well, he reports to the Settlement Council, as I recall, and I believe he's paid on a grant from the Territorial Government. I'm not certain about how he's paid, but he is an employee in the community. So we work through him. On our seismic work particularly in Aklavik, one of our supervisors would go in well ahead of time and talk to the Council, tell them what the program is there and have them advise as many people as they can that work is going to be available and then they go back in to get the crew to go out to



the group.

Q Mr. Sider, one other matter that Dr. Hobart referred to in the reports he's done on your operation in Coppermine is <sup>that</sup> what he saw to be an experience of supervisors going rather easier on native northerners in your employment than on others. Is that an experience that has gone on?

2 WITNESS SIDER: Yes, I would  
1 have to agree with that. In the initial stages of  
employing natives there was a -- obviously a different  
cultural background, a lack of understanding, perhaps,  
for what their needs were in relation to what the  
supervisor would normally have expected. Certainly  
Dr. Hobart in his report has identified part of it  
is related to communications and therefore there was  
perhaps a bending over, if that's a good phrase, in  
17 certain situations that the supervisor was being more  
18 -- was being easier on the native employee than he  
would, for instance, on a southerner. We've had  
a number of in-house discussions and seminars, and  
of course we've had a lot or I guess pretty well all  
of our supervisors in the north attend the Supervisory  
C\_onferences that have been put on by Nortran, and the  
learning process has taken place with them as it  
has with the natives and I would say that now there  
is very little difference made between a native and  
southern worker.

Q When you say "very little difference", why is that, because the native worker is a worker with some experience with you?





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A Yes.

Q What do you do with a newly hired native employee?

A There is a tendency to let down, be a little less restrictive, a little less tough in the supervision.

Q Does that cause any kind of resentment in the work force?

A No, we haven't had any experiences that would have suggested that there was strong resentments by southerners. On the contrary, I think Dr. Hobart has pointed out that the relationship between the native worker and his peer group has been just excellent, particularly as far as the camp accommodation is concerned. We find that the native is an excellent camp citizen, fits in extremely well and just no problems whatsoever.

Q Would it be possible to treat newly hired native employees as every other employee for the purposes of supervision? I take it it would?

A It would depend on how much work experience he's had before.

Q Mr. Tod, does Imperial have any experience with this kind of problem?

WITNESS TOD: I guess we don't really consider it in the form of a problem, in that our supervisors and basically our company policy is that we want to do as much as we can to help to assimilate this group of people into a work force, and as



such we have looked at some of the absenteeism, for instance, a little bit more leniently than what we would do with a southerner; but in other respects we don't really find any difference, and it is not really causing us a problem.

Q Mr. Wopnford, what about Shell?

WITNESS WOPNFORD: I would say with the people that we have, the situation is probably somewhat different in that a lot of the people that we have hired have had work experience, and generally speaking we've had good success with their work habits. Sometimes we've had problems, as we related before, with them not coming back on shift which may cause a problem, but generally we're not --

Q But apart from that, Shell's experience has been that native employees are treated no differently from anyone else?

A Well, in terms of for instance not coming back on schedule, with our white southern workers I think -- or any southern workers, I think generally they wouldn't be given a chance to come back a second, or certainly a third time. But we do do that here, we do make that exception here.

Q I take it, Mr. Sider, that as far as you're concerned, none of the three companies have experienced any of these problems that we've been speaking of in connection with a union operation.

WITNESS SIDER: No sir.



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1 Q And do any of your  
2 southern operations that are unionized have experience  
3 relating to the treatment that Dr. Hobart refers to of  
4 supervisors going rather easier on native employees  
5 than other employees?

6 A The situation would be  
7 very similar, initially at one of our gas plants in  
8 the south; but again the same sort of change has taken  
9 place both between supervisors and the trainees.

10 Q And how has that been  
11 affected by, if at all, the existence of the trade  
12 union?

13 A Certainly no strong  
14 adverse problems, as I am aware of.

15 Q The union has not  
16 insisted on any kind of equal disciplining?

17 A No.

18 Q Is that built into the  
19 collective agreement, or is that simply a matter of  
20 understanding?

21 A Just a matter of  
22 communication.

23 MR. GOUDGE: Sir, I notice  
24 it is 11 o'clock. Would this be appropriate? It  
25 would be appropriate for me.

26 THE COMMISSIONER: Right,  
27 we'll adjourn for coffee.

28 (PROCEEDINGS ADJOURNED FOR A FEW MINUTES)





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(PROCEEDINGS RESUMED PURSUANT TO AJOURNMENT)

THE COMMISSIONER: I gather,  
has  
gentlemen, that Mr. Goudge /just about completed his  
questioning.

MR. GOUDGE: Yes, sir. Just  
a few more areas to deal with. Mr. Sider, we were  
dealing before the break with your experience in the  
delta to date and you've described in some detail your  
experiences, particularly with what I might call  
unscheduled absences and you've said as I understood you,  
that that did not prove in any way an insuperable  
problem.

WITNESS SIDER: Correct.

Q Is that because you've  
been working to date in what I might call exploration  
and drilling activities, and would there be a difference  
in the magnitude of unscheduled absence if you were  
engaged in 24-hour operation of a gas plant?

A Well, certainly, as far  
as our activities at the present time in exploration,  
they are a 24-hour operation so the production facilities  
will be similar.

Q I asked the question  
arising out of page 20 of your responses where you  
draw a distinction, if you'll get the document before  
you, between unscheduled absence and scheduled deviation.  
Am I right that the inference is you can tolerate  
scheduled deviation but not unscheduled absence, given  
that you're dealing with a 24 hour a day gas plant  
operation?



A I think certainly there's  
no question that what we've been encouraging our  
native workers to do as far as supervisors are con-  
cerned that if they -- if they reach a point of time  
when they feel they would like an extended work break,  
that it can be arranged without too many problems if  
they discuss it with their immediate supervisor, rather  
than simply waiting until they return to their home  
community and perhaps notifying the expeditor only a  
day or so before they're scheduled to return. So it's  
simply a capability that they provide the supervisor  
in better planning and scheduling his work force.

Q Dealing with though with  
your gas plant proposal, are you prepared to say that  
unscheduled absence is a problem with which you'll be  
able to live?

A We'll be able to live  
with it. There will be difficulties, no doubt.

Q And you will not require  
that there be no unscheduled absences but at the most  
scheduled deviation?

A Unscheduled absences  
really are not going to be specific only to delta  
operations. They happen in all of our operations.

Q Would you agree with me  
that you won't require a total lack of unscheduled  
absences?

A Yes, I would agree with  
that, Mr. Goudge.

Q Dealing in rather more



Shell, Ted, Woonford  
Cross-Exam by Goudge

specifics with your proposal now as opposed to your experience, you said, I think yesterday that the total for the three companies in employment figures for the three gas plants was what -- 160 -- did I catch that figure correctly?

A Yes. We projected at the time that we put these numbers together 160 and we would simply suggest that those are perhaps ball park figures. I think particularly now with the introduction of the third gas plant we would see that figure rising to 180 perhaps.

Q How would the figures break down as between the companies?

WITNESS TOD: We're looking at approximately 65 to 70 people at the Imperial plant.

Q 65 to 70, Mr. Tod?

A Yes. Now, that is not people on site, that would be people employed rather than the people that would be on site at any one given time.

Q So Imperial is 65 to 70. What about Gulf, Mr. Sider?

WITNESS SIDER: I would think that would be a fair estimate for Gulf.

Q And Shell, Mr. Woonford?

WITNESS WOPNFORD:

A Our plans aren't quite as far along. We're talking more in the terms of probably 15 to 25 and that's a fairly wide range but I think it's an upper and lower limit.

Q 15 to 25?





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Cross-Exam by Goudge

A Yes. Yes.

Q And in each of three cases those would be permanent employees?

WITNESS SIDER: Yes sir.

WITNESS TOD: Yes sir.

WITNESS WOPNFORD: Yes sir.

Q Another figure I think you gave us yesterday was the figure for the total of drilling seismic and workover operations that would result consequent on your proposal and the figure there was 1200 as I understood it.

WITNESS SIDER: That's correct sir.

Q How does that break down as between the three companies?

A We don't have a specific break down on that Mr. Goudge at the present time.

Q Could you give me an estimate or could you provide one?

A Again, we're going to simply talk in ball park figures and you know 3 to 4 hundred for each of the companies.

Q And, again, are those permanent or seasonal figures?

A They're a combination of both, Mr. Goudge. Predominant would be seasonal.

Q Yes. And if -- if you were dealing with permanent employees, apart from the gas plant figures you gave me a moment ago, what would the ball park figure be in total and then for each of



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Cross-Exam by Goudge

the three companies?

A I would think that probably 25 per cent of that number would be permanent. The rest would be seasonal.

Q Now do I understand that the 1200 figure does not include employees engaged for the construction of the gas plant.

A That is correct sir.

Q Construction work force is something separate?

A Yes, sir.

Q Yes. And that the 1200 relates to the ongoing exploration, drilling and work-over work that the three companies will be doing after the gas plants are in business.

A Yes, sir.

Q And what about the construction work force? To build the gas plant? Do you have a ball park figure for that?

WITNESS TOD: Pardon me. We've done some work in this area. Our plans<sup>are</sup> still not sufficiently complete on the construction phase to be able to break it down with a great deal of accuracy, however, we are looking at probably on an average basis for the three plants, peaking out at about 400 people

Q Four hundred in the construction work force?

A That's correct. There will be a build up and a tail off, but we haven't got



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those numbers adequately projected at this point in time.

Q Now one small point, Mr. Sider, to go back to the operation number you gave me, is that 160 a number based on fully automated gas plants or is that 160 based on the early phases of the operation before it becomes fully automated?

WITNESS SIDER:

A No sir. We're talking about a high degree of automation.

Q Now, as I understood your evidence yesterday, Mr. Sider, none of your exploration activity has involved unions, is that correct?

A That's correct sir.

Q And your best guess is at the moment that your future exploration activity will not involve unions?

A To be hoped, yes sir.

Q Has any of your exploration activity ever involved unions or is this something peculiar to the north?

A No sir, they have never involved unions.

Q I see. As to the operation of your gas plants, I take it you do anticipate the involvement of trade unions?

A No. We we anticipate that we will not be involved with unions sir.

Q Although your gas plants elsewhere are unionized, I think you said?

A Our gas plants as far as





Sider, Tod, Wopnford  
Cross-Exam by Goudge

1 Gulf is concerned in Alberta are independent unions  
2 and we --

3 Q And they've promised not  
4 to go north of sixty?

5 THE COMMISSIONER: Independent --  
6 you mean independent of what?

7 A They're independent gas  
8 and oil unions.

9 THE COMMISSIONER: I take it  
10 they're not affiliated with the Canadian Labor Congress, is  
11 that the point?

12 MR. GOUDGE: I take it what  
13 you mean, Mr. Sider, is that they have no other locals  
14 besides your gas plants?

15 A That's right, sir. Yes.

16 Q How many locals do they  
17 have?

18 A I believe the number, sir,  
19 would be five. I could stand to be corrected on that.

20 Q And in numbers of employees  
21 what would that mean?

22 A I can't estimate that sir.

23 Q Mr. Tod, is Imperial's  
24 gas plant operation unionized?

25 WITNESS TOD: No sir.

26 Q Mr. Wopnford, what about  
27 Shell?

28 WITNESS WOPNFORD: We have a  
29 bit of a mix; oil, chemical and atomic workers have --  
30 are present at the Waterton gas plant, which is our



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Cross-Exam by Goudge

largest one in the south. At -- the other gas plants we have employee associations. I believe that's the only

Q You have no unorganized gas plants?

A No sir. They're just associations -- they're employee associations.

Q Do they engage in collective bargaining?

A By plant.

THE COMMISSIONER: To start with, are they certified by the Alberta Labor Relations Board? The employee associations?

A I believe they are.

THE COMMISSIONER: Well then they must engage in collective bargaining.

A Yes, that's correct.

THE COMMISSIONER: What about your exploratory wells in Alberta, are they unionized or not?

A No. The only unionized operation we have in our E & P, Exploration and Productions, is the one union at --

MR. GOUDGE: I can't hear you, Mr. Wopnford, I'm sorry.

A I'm sorry. The only exploration and productions operation that we have that is unionized is the Waterton gas plant.

THE COMMISSIONER: Well, in Alberta, then, who do the oil, atomic and chemical



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Cross-Exam by Goudge

1 workers represent? I thought they represented people  
2 in the oil and gas industry.

3 A I believe at the refineries.  
4 some of the refineries that are unionized. They're  
5 outside of our particular department of the company,  
6 but--

7 THE COMMISSIONER: Is Norman  
8 Wells unionized?

9 WITNESS TOD: No sir.

10 MR. GOUDGE: So I take it  
11 the picture is at present that some of Gulf's gas  
12 plants in the south are unionized through independent  
13 unions, all of Shell's are unionized either through  
14 oil, chemical or employees associations, and none of  
15 Imperial's are unionized?

16 A Yes.

17 Q Why do you anticipate  
18 Mr. Sider that the operation up here will not be  
19 unionized?

20 WITNESS SIDER: I would hope  
21 that we can establish a level of communications with  
22 the proposed staff that will preclude the necessity  
23 of their entering into a collective agreement. We have  
24 we have done -- or attempted that process in other  
25 work locations to some degree of success and to some  
26 degree of failure.

27 MR. BALLEM: Mr. Commissioner,  
28 I wonder if we're not wandering just a little bit afar  
29 from the -- from this Inquiry at this stage. It occurs  
30 to me we may be.





Sider, Tod, Wornford  
Cross-Exam by Goudge

THE COMMISSIONER: Well we may be but I would think that this subject has pretty well been exhausted anyway, hasn't it?

MR. GOUDGE: I've one more area, obviously the construction area. My concern, just to satisfy my friend, obviously, is that there may be implications for local and native employment should there be a union operation of one kind or another and obviously that's one of the areas that I think is of concern to this Inquiry.

THE COMMISSIONER: Yes, and I think that the pipeline construction coming across the delta and then down the east side of the delta, right past -- starting at Taglu, with another line starting at Parsons Lake, if Alaska is any precedent that pipeline will be unionized and one of the obligations of this Inquiry is to indicate what the main lines of any collective agreement along the pipeline ought to be and the whole employment picture in relation to the pipeline and construction of the gas plants going on at the same time as we are told it is intended it should. It seems to me it should be rounded out, that's one our problems. In Alaska, the pipeline is unionized and we've had some indication that the union -- unions play a large part -- some say too large a part, in the project in Alaska. At any rate, I think I'll let Mr. Goudge complete this line of questioning and we'll pass on.

MR. GOUDGE: The one other area I'd like to explore with you Mr. Sider, in that



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connection is the construction.

THE COMMISSIONER: It's none of our business whether Gulf and these other companies are unionized or not. That's not our --

MR. BALLEM: I think that's probably what was kind of in my mind.

THE COMMISSIONER: It's nothing to do with us.

MR. BALLEM: Mr. Goudge doesn't seem to feel that way, though.

THE COMMISSIONER: You see the guidelines contemplate that pipeline construction will be unionized. They even refer to the conventions of the I.L.O. which are essentially conventions established at the instigation of trade unions throughout the world so -- and as I say if Alaska is any precedent, we have to start thinking about this, and what their role should be and what the extent of it ought to be. You people maybe should --

WITNESS SIDER: We're vitally concerned, Mr. Commissioner and we wish you well in your endeavors. We hope that we can participate.

MR. GOUDGE: Mr. Sider, what about the construction of the gas plants, do you anticipate that unions will be involved in that?

A I would strongly suspect that yes, they will be involved in the construction.

Q I take it there your experience has been one of union involvement?

A Generally, yes.



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Cross-Exam by Goudge

Q Have you had any experience  
in the past with gas plant construction involving  
union contracts which provide for any kind of hiring  
preference?

A No sir.

Q Can you tell us what  
unions you would anticipate being involved in the  
construction of the gas plants?

WITNESS TOD:

A You're basically looking  
at all of the craft unions, the welders, the carpenters,  
the iron workers, that type of union. Boiler makers.  
Would be the types of unions that would be involved in  
the construction of the gas plant.

Q And do you have any in-  
formation, Mr. Tod as to whether these unions engage  
in hiring hall practices.? Do they use hiring  
halls?

A Most of them do, yes.

Q And those hiring halls  
would be in the south, or would you anticipate for  
this project they would be in the north?

A I guess that this is  
conjecture on my part, but, I would anticipate that  
there would be hiring locations both in the north  
and in the south.

Q I see. I take <sup>it</sup> that in  
part would be a matter of negotiation between the  
companies and the unions involved?

WITNESS SIDER: I might say  
that as far as our company is concerned that the point





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of time in which we enter into the -- are closer into the area of construction phase, that with as much lead time as possible we'll place high priority on our discussions between our contractor and our company labor relations personnel.

Q And I take it you would hope to have very substantial influence over the contractor's negotiations with the unions?

A Yes sir.

Q And is one of your positions going to be an insistence on northern hiring halls?

A Yes sir.

Q Mr Tod?

WITNESS TOD: Yes sir.

Q Mr. Wopnford!

WITNESS WOPNFORD: Yes sir.

THE COMMISSIONER: No doubt the construction of the gas plants will be unionized. That's the thrust of what you've said?

WITNESS SIDER: Yes sir.

Q Very briefly, Mr. Sider, let me move to what I might call a transferability of skills. There's no doubt that you've employed large numbers or some native and northerners in your exploration work. I take it in many cases that they will have gained skills which would fit them for construction work?

A I'm sorry --

Q Which would fit them for



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Cross-Exam by Goudge

construction work?

A Yes, sir.

Q The one area in which there may be a uniqueness of skills is the operation work, where one appears to have to gain experience from the ground up, and that's the Nortran program?

A Yes, sir. I might say that -- Mr. Goudge -- that the employees of our company that are part of the Nortran program that are currently training in the south, I would fully expect that those individuals, if they desire, would be moved north, onto the construction site because I think the experience has been that the knowledge and experience gained during the construction phase is very desirable if not essential to the start up of the facility. So it would be our intent to involve those trainees as early as possible in the construction phase.

Q So that they could then move on as full-time employees in the operations phase?

A Well, they are full-time employees currently and <sup>it</sup> simply would be that they would have greater expertise and fill positions of greater responsibility in the operating plant in the Parsons Lake.

Q But I take it while they were up here during the construction phase they would be engaged in construction work? Not construction work per se but involved in more the monitoring aspect perhaps of what is being constructed. Now before I leave the construction work, do the companies



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Cross-Exam by Goudge

have at present, or will they have in the near future a list of the occupations to be involved in the constructing of these plants?

WITNESS WOPNFORD: I believe that's the -- that will be developed by our contractors

Q And you haven't get got to that stage, Mr. Wopnford?

A We hadn't chosen the contractor for this operation.

Q But if I asked you for the classifications that the 400 employees you spoke about earlier would fall into, could you give me that

WITNESS SIDER: I think in our -- in our responses volume on page nine, we have identified a number of classifications related to the construction phase, Mr. Goudge, <sup>Q</sup> It doesn't come to 400, that's my difficulty.

WITNESS TOD:

Yes, but what you have to do is to consider all other activities that are going on at the same time in order to come <sup>up</sup> with the total number. In other words, you cannot isolate just the gas plant construction by itself. All of these other things are going on to give you the total of the 400 people that would be on site.

Q All what other things, Mr. Tod.

A Well the building of -- the construction of clusters, gathering line construction, dock preparation, airstrip and associated facilities, these are all encompassing. What we





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consider as the plant construction activity.

Q What I'm really asking you to do though, is if you'd be good enough to prepare the same kind of classification list with a bottom line saying "total comes to 400"? Is that possible?

A That's possible but I think that the difficulty with coming up with that particular number is that it's just a guesstimate at this point in time that is not based on our knowledge of what the actual fabrication is going to be. We haven't gotten far enough along with the designs. For instance to know the type of compression that will be going in and its configuration. So therefore, how many pipefitters, electricians and so on that you require. Now -- what you can do is maybe pro-rate from some other job, but it's not going to give you, I don't think, any better indication than the numbers that are already included here.

WITNESS SIDER: On pages seven, eight and nine, Mr. Goudge.

Q Well, I'd be grateful if you wouldn't mind going to the effort to do that, Mr. Tod, quite accepting the qualification you put on it, it would be helpful to us to have the relative percentages of classification numbers that are going to be involved.

WITNESS TOD: We'll undertake to do it.

Q Just one or two questions



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relating to the hiring policies that the companies proposed both for their construction and further exploration program. I take it from your evidence as a whole that you propose to engage in separate hiring policies and in no sense to engage in co-operative hiring policy.

WITNESS SIDER: That would be correct.

Q Your evidence in chief, your prepared evidence refers to, on page eight, to flexible hiring policies. Could you unpack that phrase for me a little bit? Do you have any more particular concept of what you mean by "flexible hiring practises"?

A We seem to have had some book mislaid here.

Q It's right at the top of page eight, sir.

WITNESS WOPNFORD: The kind of thing that we were considering there was, for instance some flexibility in the rotation program where, with some warning of people not wanting to come back on a regular two and one shift, for instance, taking some extra time off and so on, that could be reasonably arranged.

Q So that gets us back to the absentee problem we spoke of?

A Yes.

WITNESS SIDER: I think it probably also would, Mr. Goudge, include what we have already demonstrated. Our preparedness to accept individuals



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who perhaps do not have the necessary academic qualifications that we would normally expect.

Q When you say "individuals", I take it you mean natives?

5 A Yes, sir.

Q Anything else that you'd like to build into that phrase or does that cover it?

7 A I think that's generalizing sufficiently.

Q Now, finally, one question relating to your, in so far as your proposal is concerned <sup>that</sup> relates to the practice that you intend to follow relating to crews in and crews out. Have you developed any consensus as to the rotation you propose? Will it be two weeks in and one week out?

A This is on the operating phase, Mr. Goudge?

Q Yes.

12 A I think that our position  
20 would be that we haven't come to any firm conclusion on that. I mentioned earlier our philosophy I think towards the staff that will operate our plant and I would hope that the people who will be selected to  
4 work in the Parsons Lake plant will have some input into the type of schedule that they themselves would like to work.

Q Are you suggesting there will be individual schedules rather than crew schedules?

A No, I don't think that we'd be in a position to permit individual scheduling.





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Cross-Exam by Goudge

But I think there can be some selection perhaps and general agreement by the individuals who are going to be employed there.

Q Mr. Tod, what about Imperial?

WITNESS TOD: We haven't finalized the type of schedule that we will be having for the operations up here. Like Bruce has indicated, we have a number of different types of schedules in our operations in the south. The degree of flexibility is kind of up to the individuals that are located at the specific plant that is in operation. If they express a desire to work on some certain type of schedule then we work with them to see that it can work out both to their mutual satisfaction and to ours, and as a result of that, we do have a number of different types of schedules. So therefore, I think that the same thing would apply here to state to you now that it would be one schedule as opposed to another would not be very appropriate.

Q Mr. Wopnford, does Shell follow the same pattern?

WITNESS WOPNFORD: Yes, that's correct. I think just considering the distance and so on, I would doubt, for instance that we would go to a four day work week or something similar to that.

Q But you're prepared to consult with the employees concerned to develop the most mutually satisfactory schedule change?

A That is correct, yes.



Sider, Tod, Wopnford  
Cross-Exam by Goudge

Q Now, the Van Ginkel study, you've told us about is presently under way as I understand it. On the study of physical loading on communities as I might call it?

WITNESS SIDER: Yes, sir.

Q And when did you say that study will be ready?

A As I understand it, Mr. Goudge, four to six weeks.

Q Do you know whether that includes an analysis of things like increased loading on the judicial system?

A I'm not too sure that they've identified the judicial system.

Q I raise that because my information is that that's been a very substantial problem in Alaska. Are you familiar with that?

A No sir.

Q Have the companies turned their attention to that, either through Van Ginkel's or in any other way?

WITNESS WOPNFORD:

A No, we haven't.

Q You can't tell me whether Van Ginkel's is addressing that or not?

WITNESS SIDER:

A No, I'm sorry, Mr. Goudge. I can't.

Q Mr. Tod, has Imperial turned it's attention to that?

WITNESS TOD: No sir, we have not.



Sider, Tod, Wopnford  
Cross-Exam by Goudge

WITNESS, SIDER:

A It's our -- it is our understanding that there is a study underway at the present time by the R.C.M.P. Now whether that is all encompassing, I have no idea.

Q What does that study involve as far as your information goes?

A I have no idea. It perhaps is only related strictly in terms of their own particular staffing.

THE COMMISSIONER: I think that there was a reference to that in the papers. Superintendent Butler had examined the problems that a pipeline, if one were built, would bring with it, from the point of view of the force and its staffing. I think you should ask him for that.

MR. GOUDGE: Yes, sir.

THE COMMISSIONER: Along with those Coppermine figures.

MR. GOUDGE: Yes, I've spoken to Mr. Bayly. Now, finally, Mr. Sider, is it fair to say that the kind of -- the thrust of principle behind your evidence in chief is the desire of the companies to so structure their programs that the opportunity to engage in employment for natives and northerners is created or maximized?

WITNESS SIDER: I would prefer to use the word maximize. I think that we have stated on a number of occasions that we are prepared and will provide preferred employment to northerners and will give preferential treatment in our selection





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process.

Q Yes, and the social concern behind that is the company's view of the desirability of adding to the range of opportunities available to northern and native residents?

A Yes, sir.

Q Now, I think those are the questions I have, sir, subject to two or three questions that have been handed to me from the Chamber of Commerce and the Town of Inuvik and if you're content, sir, I'd like to ask them now. First from the Inuvik and District Chamber of Commerce, Mr. Sider, the question is -- concerns the use of the Inuvik MOT airport during the facility construction. Where the gas producers and -- perhaps you can't speak for them -- but the pipeline company's plan to make use of that airport. In your view, will the airport be adequate for both the use you anticipate making, and other use?

A I think as far as Gulf is concerned, I'll leave that question, Mr. Goudge, to our policy witness.

Q Would the other gentlemen on the panel do the same?

WITNESS TOD: I have no information, sir.

Q You're prepared to have the policy witness tackle that? And you, Mr. Wopnford?

WITNESS WOPNFORD: Were you asking if in my opinion the --



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Cross-Exam by Goudge

Q Do you want to answer  
it or would you prefer the policy witness to answer it?

A I would like you to  
clarify the question, please.

Q The question basically is  
whether in your view, given the use you see being made  
of the Inuvik MOT airport, by your company, the other  
producers and the pipeline company, is the facility  
presently adequate to provide that use and the uses  
that will be required of it by others?

A I would have to say that  
we haven't conducted a study yet. It's something that  
we have discussed and I think that it would require  
some study to make certain that we do have that facility  
available to us.

Q So what you're saying, as  
I understand it is, the airport facility will require  
improvement if the use proposed is to be made?

A No sir. I think that we  
have to determine what the traffic is going to be and  
then we would decide whether it requires an upgrading.  
I believe that the DOT has done some work and I under-  
stand that they <sup>think they</sup> would have to do some upgrading, but  
I'm not certain of that.

Q Now, I have four questions  
supplied by the Town of Inuvik. Mr. Sider, what plans  
does Gulf have for the utilization of the Inuvik MOT  
airstrip for large aircraft landing in the transfer of  
materials and personnel to the Parsons Lake <sup>site</sup> by small  
aircraft or by road?



Sider, Tod, Wopnford  
Cross-Exam by Goudge

WITNESS SIDER: I think that  
4 that question, Mr. Goudge, fits into the same  
classification as the last one <sup>and</sup> will be handled by the  
policy.

5 Q Yes, sir. Secondly, is  
6 are  
Gulf aware that there/plans for the Inuvik, Tuktoyaktuk  
extension of the Mackenzie highway to go close to the  
Parsons Lake gas plants site?

A The answer to that would  
be yes.

Q And does Gulf have any  
plans to make use of this highway?

A To the best of my  
knowledge, no sir.

Q Do you, for example,  
intend to house any of your Parsons Lake employees  
in Inuvik to have them commute on a daily basis by  
that road?

A I certainly wouldn't see  
that as a high probability.

Q What about the construction  
crews?

A No sir.

Q Thirdly sir, what plans  
does Gulf have for basing the operating personnel for  
the Parsons Lake plant in Inuvik. Well, I take it  
you've just answered that question?

A Yes sir.

Q Are you aware, sir, that  
in some of the southern provinces personnel operating



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Cross-Exam by Goudge

gas plants do travel the kind of distance that will be involved between Inuvik and Parsons Lake along that road?

A Yes, sir.

Q And, finally --

A In Alberta, sir.

THE COMMISSIONER: How far is the distance, though, on the road?

A I would think, Mr. Commissioner, upwards of thirty five to forty miles they're travelling on a daily basis.

MR. GOUDGE:

Q Finally, Mr. Sider, this question, I think has already been asked, but perhaps if you can, you'd be good enough to answer it now. Does Gulf plan to provide heating gas and liquid products for use of Inuvik and other delta communities?

A That question, sir, will be handled by the policy witness.

MR. GOUDGE: Thank you. That completes the questions I have been asked to ask, sir and that completes my cross-examination.

MR. BALLEM: I have no questions on re-direct sir.

THE COMMISSIONER: Well, thank you very much Mr. Wopnford, Mr. Sider, Mr. Tod. We'll ask you to step down and the policy panel then. We'll just stop for a minute or two and let the --

(WITNESSES ASIDE)

(PROCEEDINGS ADJOURNED FOR A FEW MINUTES)

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)





MR. BALLEM: Mr. Commissioner  
I would like to introduce the policy panel which is  
the last panel that <sup>we</sup> will be calling and there's one  
that hasn't been sworn.

J. EDWARD CZAJA, sworn :  
R. HORSFIELD, resumed :  
D. R. MOTYKA, sworn :

MR. BALLEM: The gentlemen  
who has just sworn is Mr. Edward Czaja and he is the  
general manager of the production department of Shell  
Canada Limited. In the center is Mr. Rolland Horsfield,  
you've met him before and he is the corporate manager,  
Arctic region for Imperial Oil Limited. At the end  
is Mr. Dan Motyka who was sworn the other day, as you'll  
recall and Mr. Motyka is the manager, development,  
exploration and production department for Gulf Oil  
Canada Limited. We do not have any additional state-  
ments to be made by this panel. They are produced  
here to respond to such questions as may be directed  
to them and a very few that have been deferred  
to them. So they are now available for cross-examination.

THE COMMISSIONER: Fine. Mr.  
Carter?

MR. CARTER: I have no questions  
of this panel sir.

THE COMMISSIONER: Mr. Lutes?

MR. LUTES: No questions, Mr.  
Commissioner.

THE COMMISSIONER: Mr. Bell?  
CROSS-EXAMINATION BY MR. BELL: Gentlemen, in the  
evidence of the socio-economic panel, they stated that



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Cross-Exam by Bell

it was one of the policies of the producers that native people should be afforded a prospect of economic opportunity and social and cultural equality -- I mean social and cultural security, equivalent to that offered southern Canadians. The people that I represent the Indian people in the Mackenzie District, do have a concern that development in the north will lead to their becoming disadvantaged with respect to other population groups in the north in the same way that natives in the south have become disadvantaged with respect to other population groups in the south. I was wondering if you'd agree with me that one of the contributing factors to this problem for native people in the south is the fact that they are outnumbered, quite simply, by non-native groups in the south. Would you go along with me on that?

WITNESS HORSFIELD: That may be one of the reasons.

Q Yes. As a result they have a very small proportion of the political power in the south. Their voice isn't as loud as other groups.

A Yes.

MR. BALLEM: I think I should remind Mr. Bell that these gentlemen are produced here as policy witnesses for the companies and not for government in any sense.

WITNESS MOTYKA: Mr. Commissioner, I would like to make a statement to Mr. Bell's, what I think is his leading question. I hold to the opinion



that if the North American native had conducted an environmental assessment and socio-economic assessment as to whether we Europeans of European stock should come to North America, we never would have been here. However, by the same token, I believe that the social awareness of all concerned is increasing and we wish to share your social concern that the ongoing development will be to our mutual benefit.

O Yes. I appreciate the concern that you've expressed, sir. I'm just trying to get at some of the ways in which it can be put into effect. I think that you'd agree with me that good intentions are not enough. You have to have some practical method of achieving your goals and the oil companies, to their credit, have done something in this area. They've instituted the Nortran training program to try and encourage native people to participate in the hydrocarbon developments in the north. This of course would reduce the possibility that immigrants from the south would come in to take the jobs on this project. However, I would suggest that, I think it's clear that even if all the native people who were interested took the jobs in your project, that they would still not fill all of the positions. That there would still result an influx of white southerners, which of course means that the majority the native people now have in the north is eroded somewhat. I think that you'd agree with me that this is inherent in the development process that the -- that it's not restricted to this particular project. It would occur





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if there were a mine or some other kind of economic development going on up here. I was wondering if you could help me on this, if you've given any thought as to how the oil companies might tackle this problem, if indeed, they are able to.

WITNESS HORSFIELD: Mr. Bell, I think you are correct that there will be more opportunities and more jobs as a result of development than there are local people in the north, eventually. Whether or not this leads to any disadvantage status I don't know. Really, all we can do is offer the opportunities to these people, which I think we're doing.

WITNESS CZAJA: Mr. Bell, if I may just expand on that in speaking on Shell's behalf, we far prefer to hire locally, have the people come from the local communities. Our experience has been that it lends a stability to the community. The people themselves are living with their friends and relatives, if you like. And we appreciate that when we first move into this area and start producing operation, there's going to be a lack of trained personnel that can fill these jobs. Now, we are into the Nortran program. We are attempting to accommodate as many people as possibly want the opportunity to work in exploratory, and hopefully the development. I think we'll have to probably be more accommodating. I think you've heard from the witnesses on the panel just prior to us that we'll have to provide more flexibility in our way of thinking. That we do work



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Cross-Exam by Bell

1 with these people and lay on the programs that will  
2 allow them to assume a meaningful role in this develop-  
3 ment. If we're-hopefully over time we can see the  
4 southerners that indeed want to move, <sup>back</sup> if we're having  
5 them placed here or if they're commuting. We'll no  
6 longer have to be coming in operating the plant.  
7 Hopefully they can be 100 per cent run by northerners,  
8 provided they reach the qualifications that are re-  
9 quired. It's very difficult for me to give you a very  
10 nice blueprint for all -- all this will happen.

11 We are encouraged by the fact  
12 in the time that we have been here that we are making  
13 some progress. I think with the continuing cooperation  
14 with the industry and the local inhabitants working  
15 within the communities that we can effect this sort  
16 of thing.

17 Q Do any of the other  
18 members of the panel have anything to add?

19 WITNESS MOTYKA: Just that  
20 changes are traumatic , Mr. Bell and have positive  
21 as well as negative aspects.

22 Q Thank you. Well, perhaps  
23 I could move onto a question which was deferred to  
24 this panel by the socio-economic panel. They said  
25 in their direct evidence that, "during the construction  
26 period, demand for barges will be high, but the  
27 actual impact cannot be assessed until we are able  
28 to identify the proportional amounts of prefabricated  
29 modules that will be coming either by sea-lift or by  
30 the Mackenzie system." Now the question of barge traffi-



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Cross-Exam by Bell

is an important one. I think we've seen examples in Alaska where the construction material has displaced conventional supplies from the modes of transportation over there, with the resulting upward pressure on prices for conventional supplies. I was wondering if the oil companies had any policy with regard to the use of the existing barge system or its expansion for the purposes of this project.

WITNESS CZAJA: Mr. Bell it may be helpful to you to have me just relate how we plan a project and the various processes we go through and what indeed has been done to date.

With a discovery of a gas field as we have at Nig with continuing delineation drilling, we determine the approximate size of the reserve and from this flows the approximate size of the plant. You have seen, for example, the construction schedule that we contemplate. Now, in breaking down that construction schedule into the details, we attempt to identify the most critical aspects of the project. Clearly in our case, and I believe it would be true for the other producers, the gas plant is the critical path. It's the most important portion of it. It needs to be designed well in advance. The modules have to be built, wherever they are going to be built.

This, then flows into the problem of moving those modules onto site. We quickly realize that there's an ongoing barge traffic to service the communities in this area, maintaining presumably the level of exploration that is now going



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on. This is current business the N.T.C.L. has.

We jointly approached Arctic Gas to feed in our numbers. Now they, at this stage, are indeed tentative as the design progresses a little further, there will indeed, be better definition of what those tonnages are, particularly when we can resolve where the modules are coming from, whether they come up the Mackenzie or whether they go around Alaska.

In sitting down with Arctic Gas, really I don't have numbers here, but our tonnages are relatively small compared with the impact that the Arctic Gas project would have on the system. Arctic Gas, then has had meetings with N.T.C.L. in forecasting the approximate timing that Arctic Gas may be requiring staging sites, Hay River, the barge and the tug requirements. Although they are only in the planning stage, we are aware that N.T.C.L. has already had discussions with the government on future requirements.

These relate<sup>to</sup> not only the equipment, the barges and tugs, but the long lead times required for the ordering of pumps and motors which are critical to the tug construction.

Another critical factor is the training of pilots. Pilots are not trained very easily. My understanding is this communication has been made with the Federal Government in terms of what the requirements would be. I would like to stress that in all cases, what we're dealing with here, is the





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1 additive aspect of these projects on <sup>the</sup> existing systems.  
2 Throughout the piece we have maintained that it is  
3 essential that the existing communities maintain their  
4 ability to be serviced as they have in the past and  
5 preferrably, even with improvements.

6 So what we are looking at, is  
7 a definite impact on the barge requirements of the  
8 Mackenzie, but what I am trying to advance is that  
9 planning has gone on. It's one of the most critical  
10 aspects of the project. I believe that with certifica-  
11 tion that these plans can be implemented and that is  
12 about the status that we're seeing.

13 In our view, there is no  
14 question there has to be some inconvenience. You've  
15 got that much more traffic. I can't tell you that  
16 there's going to be no inconvenience to the community.  
17 But I believe the additional barges can be provided  
18 and I think the impact on the communities will be  
19 minimal.

20 Q My understanding of the  
21 evidence that we've heard from Arctic Gas was that  
22 they intended to build what amounted to a separate  
23 barge system -- a separate fleet of barges for their  
24 own use. Is it your policy to utilize those barges  
25 only?

26 A No, you are speaking of  
27 Arctic Gas and their attempt to identify their require-  
28 ments. I believe that we can work with N.T.C.L. in  
29 having them provide the barges that are necessary. Now  
30 we haven't gone into the details of the problems of



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Cross-Exam by Bayly

providing these barges. At the present time, we don't see the need of providing our own barges. In the Arctic Gas case, of course, they have considerably larger tonnages and they may have to resort to this.

MR. BELL:

Thank you. Those are

all the questions I have.

CROSS-EXAMINATION BY MR. BAYLY:

Q

Following on

Mr. Bell's questions on barging -- and I think we've had the discussion that you and Mr. Bell entered into with the other witnesses. What I'm concerned with is whether Shell and the other companies are prepared to undertake to change their barging schedules if required because of a conflict between their needs, their scheduled needs and those of the communities. In the event that the barging carriers cannot respond quickly enough to meet the schedules that you have projected?

WITNESS CZAJA: Mr. Bayly,

I don't think there's any question in our mind that we would do this, whether it requires us changing our schedule or diverting equipment around. We have to work this way. It would be unreasonable to suppose that we'd be forcing our equipment down the river and having the community suffer by the consequences. That wouldn't be our policy at all.

Q All right. Does that

apply to the other two companies?

WITNESS HORSFIELD: That's right.

WITNESS MOTYKA: That's right.



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Cross-Exam by Bayly

Q You've referred to the lead time required for the preparation of barges and I suggested it was two years. Would you agree that that is approximately the time required for you to build that you need one and having it afloat?

WITNESS CZAJA: From what I understand of it, Mr. Bayly, the two to three years is approximately right, yes.

Q So, if you're going to inform N.T.C.L. of at least what the basis of your requirements is, you have to start right now.

A We've already done that sir. In general terms, N.T.C.L. is aware of the potential load on the river.

Q All right. Would you go to your own barge system if you found that they weren't able to supply the barges you required? Or have you thought of that yet?

A Well, you're dealing with a hypothetical situation. They haven't said to my knowledge to date, that they wouldn't be able to supply, but certainly we'd have to consider it if they were unable to.

Q What are the alternates, assuming they can't supply you with the transport? Would you bring more around the ocean route from British Columbia or have you thought of that as a contingency plan?

A That may be one of the considerations that we'd have to examine, that's right.





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I think we would make that decision after indeed, examining the plan that N.T.C.L. would have. The loading that Arctic Gas would have on the system, what the communities require, and then being certain that we can accomodate our movement within the existing traffic. I can't answer -- give you a more specific answer than that.

Q Does that apply to the other two companies that you would -- that you still aren't in a position to tell us what your alternatives would be?

WITNESS MOTYKA: Mr. Bayly, we are aware of what our alternatives are and we are evaluating them in some depth. We cannot tell you which specific alternative that we will finally select. Part of our activity -- a major portion of our activity for this year is to do all the pre-engineering logistically inclining all others so that by the time when all these other proceedings that we're involved in culminate in a decision point, we know precisely what we'll be doing and let the appropriate bodies who we will be interacting with, from a transportation point of view, be aware of what our decisions are or of what our desires are. There is a continual dialogue with the people that will finally be involved.

Q And Mr. Horsfield, what sort of dates are you looking at to have this -- the transportation logistics finalized?

WITNESS HORSFIELD: Mr. Bayly, the discussions are going on all the time between our-



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Cross-Exam by Bayly

selves and barge companies on all kinds of transport and I don't -- I can't give you a specific date.

What I do know for a fact that N.T.C.L. is aware of the problem. There are other barge contractors on the river and I really don't anticipate any problem.

Q Have you established a set of standards for barges that are acceptable for the transport of your materials to the various off-loading spots?

A We've not done that specifically that I know of.

Q Are you going to be doing that or do you feel that's a government function?

A Well, I suspect the barge operator will do that.

WITNESS CZAJA: Mr. Bayly, if I could just can follow up on that. At this stage, certainly in our case, we're into what we might call just starting the preliminary engineering. We couldn't tell you, for example, the sizes of the modules precisely, but when we do develop these in the next few months, we have the gross tonnages, and then if you start examining the module size and how they pertain to the barge requirements, this is the kind of work we can be doing with N.T.C.L. We don't anticipate any problems. I don't believe we're going to be doing anything particularly unusual that N.T.C.L. will not be able to accomodate, but if it does, we'll have to shift our plans accordingly.

Q Right. Now if you are



## Cross-Exam by Bayly

have the same sort of modules that Gulf has suggested they might<sup>have</sup> in the 1200 ton range, do you anticipate that the present barges can carry a single item of that size without either having a new barge built or adapting existing barges?

A Mr. Bayly, you're into a realm of speculation. I tried to point out to you that we are in the preliminary design phase. We may have very small modules. We may indeed design the module to be accommodated by the existing barge without having to resort to some unusual type of barge. It may be a real problem to have a large barge for a one shot proposition. If we would have an exceptionally large barge, or a large module, we may consider coming around Alaska with it. But these are the various sorts of alternatives we'll have to examine.

WITNESS MOTYKA: Mr. Bayly, I would like to clarify the point that if you had the understanding that Gulf proposed to move a 1200 ton module on the river, that is an incorrect interpretation. Larger modules were defined the other day and the larger modules in the upper hundreds and thousands range -- ton range -- would in fact have to move by sea route. It's the smaller modules at the lower end of the hundred or so ton range that would be moved by the river system.

Q I understand that. My concern of course with your project and the possibilities of barging are the possible necessities to alter the bottom of Liverpool Bay, the Fusky Lakes and possibly



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Cross-Exam by Bayly

1 scaling the sides of the Eskimo Fingers.

2 A I appreciate your concerns.  
3 We share them with you.

4 Q But you haven't yet  
5 finalized your transportation plans or even the size  
6 of your modules as I understand it, so that you can  
7 tell the people what they can expect in the way of  
8 transportation and transportation problems.

9 A From a definitive absolute  
10 point of view, your statement is correct. However,  
11 as it has been pointed out, we have conducted preliminary  
12 surveys in the Eskimo Lakes area through the Fingers,  
13 etc.. The water depths appear to be of sufficient depth  
that we will not require dredging and our current  
knowledge of the size and configuration of barges is  
such, that we do not anticipate any scaling and that's  
from our preliminary observations. Of course our --  
it has been pointed out one of our objectives for this  
year in that particular area, geographic area, is to  
get more definitive so that we can <sup>make</sup> a more absolute  
statement when the need arises. That need of course  
is associated with our specific land use application.

Q Now, Mr. Mitosh, we've  
heard from one of your other panels that if you can't  
build at Parsons Lake, that is if you are not granted  
permission --

I'm sorry,  
Mr. Bayly the end sounded familiar but the rest of  
it didn't, are you referring to me?

Q I'm sorry, could you pro-









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Cross-Exam by Bayly

of miles, but you think that's very unlikely?

A That's correct. One  
has to look at the entire data base upon which you  
make your decision and make the appropriate one.

Q What I'm suggesting  
to you is that <sup>if</sup> for some reason the government told  
you that the Husky Lakes were out of bounds, then  
you would either have to move the plant or find a  
way of building either a permanent road or a very  
good winter road during the time that you are bringing  
in supplies. Would you agree with me there?

A Under the basis of your  
hypothesis I would agree with you. However, I assure  
you, we argued strenuously, assuming that there are no  
obvious detrimental effects to the use of the Eskimo  
Lakes, we would try and impress upon all concerned  
that that is a viable means of transportation.

Q Right. Now, I appreciate  
that. I'm just -- was just asking you to follow along  
my hypothetical.

A I'm not inclined to follow  
hypothetical situations very well, thank you.

Q Well, I'll try and lead  
you down a few more before we're done.

A I'm sure you will.

MR. BAYLY: Mr. Commissioner,  
it's half past twelve and I was about to move onto  
another area. If I could say just before we adjourn,  
sir, that I have distributed the evidence of Messrs.  
Trudeau, Sargeant and Hoake, to all the participants









1 (PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

2 MR. BAYLY: When we left off  
3 this morning, Mr. Motyka, and I am pronouncing your  
4 name correctly, I take it now, we were talking about  
5 the Parsons Lake site and how it, in the opinion of  
6 Gulf, is the ideal site for extracting the gas from  
7 the formations that you have discovered. And I am  
8 wondering about the work that you are planning to do  
9 in the very near future. I take it you will be doing  
10 the work that you have described to further delineate  
11 where the facilities might be in the Parsons Lake area  
12 prior to receiving approval from the government for  
13 the project.

14 WITNESS MOTYKA: A That's  
15 correct. As you are aware, in the process of doing this  
16 preliminary work, we do also require a specific land  
17 use approval to do that particular exercise as well.

18 Q Yes and you have applied  
19 for that?

20 A Yes, sir.

21 Q In fact, as recently as  
22 the 12th of January, you made an application, as I  
23 understand, to do some test drilling to see whether  
24 the ground was suitable for the various facilities,  
25 roads, plants, etc. that you plan to put there.

26 A We did recently and I can't  
27 accept the January 12 date. I am not aware of it  
28 but we did file something this month.

29 Q All right. The basic plan  
30 that you have, as I understand, for this work is



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to drill a number of holes of depth up to 100 feet in order to test the permafrost and the formations, the shallow formations to see whether they will support the facilities and how you will have to engineer your facilities.

A Precisely.

Q And do you, do you look at the granting of this land use application as a tacit approval of this site or do you look at it merely as an approval for the purposes of exploring the possibilities of placing a plant and facilities here?

A The latter.

Q This work, as I understand it, will not use the route you would propose to bring materials in in final construction but use as the Swimming Point depot and a winter road to bring men and materials in for this program?

A That's correct.

Q Mr. Horsfield, if I can turn to you for a few minutes. I take it, since you have been here, you have had a look at the maps that were submitted and put on the back wall that were prepared by Mr. Longlitz of the Federal Government.

WITNESS HORSFIELD: The seismic maps.

Q Yes. And you would agree with me that when you look at the number of seismic lines that have been run in the Mackenzie Delta, the number in the hundreds?

A Well, there have been several but I would point out that those maps do tend to distort



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Cross-Exam by Bayly

the picture very much because of the very small scale of the map and of course the thickness of the seismic lines. It would look much better if it was put on this map behind us.

Q Right. I'm not suggesting that that it gives the kind of scale that would suggest how far apart they are to the untrained map reader's eye, but nonetheless in absolute numbers they do number in the hundreds.

A Well, I didn't count them, Mr. Bayly, but there are a lot of them there, I agree.

Q Yes, now, I accept that they are farther apart than they look on the map but some concern has been expressed and I would like you and the other two gentlemen on the panel to respond to this, that seismic information is not generally shared among companies and that this often involves different companies running seismic lines in the same area on top of the same leases. Would you agree with that?

A I agree, Mr. Bayly, it is not shared but it is quite often bought, back and forth.

Q It does result, however, in more seismic lines being run on a given area as than the original company has run. In other words, you don't just buy the information, you sometimes buy the information and run your own line.

A Well, that's quite possible, if you think you can get better records than you can buy, then you obviously go out and run some more seismic.



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Cross-Exam by Bayly

Q Is there a sort of mystique about seismic, a feeling that among companies that they don't really trust each others results and want to confirm them for themselves?

A It's not that. There are different ways of running a seismic to get clear records and to get the best interpretation. There is not just one way of doing seismic.

Q Oh, I understand that. There are triple lines and there are herring bone patterns to give a three plane rather than a two plane view of the formations, as I understand. Do you agree that I have my facts straight?

A Well, there are different patterns that can be run to get better information, yes.

Q But it isn't just to get better information, is it? You sometimes have a seismic program that follows somebody else's if you are not satisfied.

A I don't know if I quite follow you. We wouldn't just go and duplicate somebody else's seismic and do it exactly the same way without attempting to purchase the information first.

Q Yes and if you weren't satisfied with it, you would run your own lines perhaps in a slightly different position to get that three dimensional rather than two dimensional effect.

A Well, to get better records, yes.

Q Yes and would the other





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1 companies agree with that?

WITNESS CZAJA: Mr. Bayly,  
I think that, if I understand the line of your  
questioning, I would like to add a little on the  
progress that is made with seismic just like it is made  
with any other portion of our business. There are  
improving techniques. Some seismic lines can be run  
with old techniques as we learn more and improve in  
these techniques, it may require rerunning of the  
seismic. However, on the basis of the sort of  
coverage that is now available to us, we feel that very  
little additional seismic will be needed and in most  
cases with our company as we develop new techniques,  
their likelihood is they will be using the existing  
seismic lines. That generally is what we are seeing  
for the near future at any rate so I really can't see  
a proliferation, if you like, of all new seismic lines.  
We have got good coverage. I think we can use it  
effectively, should in the next few years, there be  
improvement of techniques, we would run more seismic  
but probably on the same lines.

Q So what you are saying, Mr.  
Czaja, is that we can expect that you will be taking  
the next step which will be exploratory drilling rather  
than running additional seismic lines over areas that  
have already been covered. You have done that part  
of the operation as well as it can be done?

A To a large extent, but as we  
learn more or find that there are gaps in our infor-  
mation, we have to, we may have to come back and do



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more shooting. As an example, this winter we plan to come into the Kumak area and do some additional shooting because of the problem we have in the definition primarily over water. So we are using a different technique to get better resolution. But these again are the instances that I am referring to where as we develop new ways of coming, going about it, we may indeed be back and require more information.

Q Would you plan on using the same lines or would you have to run them in different places?

A We will absolutely try to use the same lines and normally this is what we should be able to do. We feel our coverage is such that this is the program we plan to follow. In some instances it may be necessary to run new lines.

Q But basically speaking what you are saying is that if these plants are built, the people who live in this area should be surprised if a major seismic operation took place on the same ground over again. That part is basically over.

A I don't think I suggested "surprised". We got information, we know we need more. I think Mr. Horsfield, in his introductory comments, pointed out that it is an evolutionary, step-by-step process. We continue to learn, develop new techniques. We are running seismic this year. We may very well require more seismic next year. For the long term, it is questionable. If a dramatic new technique should be developed, we may be back in running new



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seismic but I think from our standpoint, most of  
the seismic largely has been done but there can be  
requirements for additional work.

Q Mr. Motyka, would you share  
that opinion?

WITNESS MOTYKA: Yes, sir.

THE COMMISSIONER: You say that  
you have done the seismic in that you are into  
exploratory drilling now. Is that a fair summary of  
where you are at?

WITNESS CZAJA: Well, Mr.  
Commissioner, it isn't such an abrupt transition. It is  
a continuing process. You can go back in the stage  
where you have the initial exploratory seismic  
reconnaissance, widespread lines. From this, our  
exploration people identify major types of structures.  
This then requires re-entering the area taking closer  
grids, if you like. In the areas where we have the  
close grid, we don't anticipate anymore would be  
required and if it would, it would be over the same  
lines. On the basis of our identification of structures  
we are into the drilling programs but indeed there  
may be more seismic required. It is difficult to have  
a definite transition piece, is the point is what I  
am trying to convey.

THE COMMISSIONER: Well, I realized  
there is a good deal of overlap but if you are not  
doing any more seismic, are you still looking for more  
volumes of gas and oil in the Delta and the Beaufort  
Sea or doing it now exclusively by exploratory drilling.





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A Well, I could give some examples, for example, what may be happening in Alberta. The first brush of seismic and exploration into development, we are finding as an example that our company is back into known areas where we indeed have got gas and with new better techniques are doing more seismic, particularly in the proximity of known gas deposits.

THE COMMISSIONER: That is in Alberta.

A In Alberta and I would see that this possibility would exist here, that we have got the large structures primarily identified and as we get better at our jobs, we need may be back and really refining our techniques probably more than anything.

THE COMMISSIONER: Right.

MR. BAYLY: So that may mean more seismic lines at a later point but you would try to use existing ones as much as possible.

A Yes, sir.

Q And I understand, for example, that this year there is a seismic program on the west side of Ellice Island and I think that is an Imperial program. Can you tell me whether that is true, Mr. Horsfield?

WITNESS HORSFIELD: I can't be sure about that. I know we do have some seismic going on, on Richards Island.

Q Yes.



Ozaj, Horsfield, Motyka  
Cross-Exam by Bayly

Well, I understand this one is one where there has been a shift of a very short distance and the lines are running parallel to the existing one so this would be an example of where your information was not sufficiently refined.

A Well, I am not familiar with the specific program that you are talking about.

Q All right. Perhaps, you could let us know through your counsel whether the one that I am referring to is an Imperial Oil program at a later time this afternoon, or whenever that information is available.

I see you nodding and for the record, can I take that as "yes".

A Yes.

Q Now, the next step in your evolutionary process of discovery is exploratory drilling and you have referred to that, Mr. Horsfield, in the evidence you gave earlier on. Now, as I understand, that besides encountering frozen ground in the near surface horizons when drilling a well that the Imperial experience has been to encounter some gas kicks at shallow depths. Is that correct?

A We have encountered gas at shallow depths, yes.

Q Yes, and is it your opinion as to whether there may be extensive gas at shallow depths in the Mackenzie Basin?

A Perhaps we better define what we mean by shallow, Mr. Bayly; if you mean within



Czaja, Horsfield, Motyka  
Cross-Exam by Bayly

the top few hundred feet, I would say, no. If you mean below 2,000 feet, I would say there is a good possibility.

Q And one of the problems with this, as I understand it, is that these shallow or relatively shallow deposits have resulted in fires at three of your wells at Reindeer F-36, at Kumak K-09 and at one of the Tiktalluck wells which, I believe is K-26. Is that your information?

A Imperial didn't drill those wells.

Q Those aren't your wells?

A No.

WITNESS MOTYKA: The F-36 location, I am familiar with. The last one you identified was which one?

Q K-26.

A I don't recollect anything resembling a fire or even a healthy blow at that one at shallow depth, but at the F-36 location, we in fact did have a very brief fire and it is postulated that a likely source for the shallow sand as you are referring to, but not to where we can say it was positively the source. With high probability that is where it came from.

Q Right and these are called hydrate fires, as I understand the language?

A Right.

Q Now, is it possible that these deposits of gas can be predicted so that you



Czaja, Horsfield, Metyka  
Cross-Exam by Bayly

don't run the risks of having fire such as the one you described?

A Yes, they can be predicted and reasonably accurately.

Q Well, what went wrong?

A If we knew the answer, we, I could give it to you very positively, it was very obviously a combination of a number of items that culminated in a gas blow out that, as we observed at the Challenger rig we visited on Sunday, the various monitoring techniques that are now available, which incidently were not available at the F-36 location back when that fire occurred. Those sort of monitoring facilities minimized to a very low probability value that sort of an occurrence. That is what they are there for.

Q And these are blowout preventers and --

A And the pit, the mud gauge volume level gauges, the other monitoring devices to determine whether there is an increase in fluid in the annular spaces and at what rate it is coming at you. These things do not happen instantaneously.

Q But they do happen if you don't have the right equipment around when you need it.

A Or if the equipment isn't properly utilized.

Q Now, when you say utilized does that mean that it could be installed and not be monitored properly or something of that nature?





Czaja, Horsfield, Motyka  
Cross-Exam by Bayly

A     Precisely, Mr. Bayly, we have car accidents everyday and it is not a function of the car most of the time.

4                    Q     So what you are suggesting is that it is possible that if a man isn't watching whatever has to be watched carefully that these can take a crew unaware. Otherwise it shouldn't happen.

A     That's correct and that's why as you noticed at the Challenger 10 location that these sort of items are better equipped with what I call idiot bells where a guy hears something going off and he knows it is time.     to get excited, he has got time. This is an evolution in technology that will help minimize the thing you are concerned about.

Q     All right. Previously you had no such alarm system as the idiot bell technique.

A     There were fewer of them.

Q     But not on the site where you had this hydrate fire?

A     That's right.

Q     If it was in fact a hydrate fire?

A     If, in fact, it was a hydrate fire.

Q     Now, in examining what you know about offshore formations, can you tell us whether there is a similar likelihood of finding these hydrate deposits at the depths that have been described by Mr. Horsfield or perhaps he might want to respond to that question.



Cedeno, Horsfield, Motyka  
Cross-Exam by Bayly

A The depth at which you can find these potential hydrate gas bearing zones that you are referring to is a function of the temperature in the reservoir that you are penetrating as well as a function of the gas gravity or the density of the gas. And theoretically it is possible anywhere where the temperature, the ambient temperature is low enough that hydrates will form and this could happen anywhere from the surface to perhaps 3 or 4,000 feet depending upon the location.

Q So, it could well happen beneath the Beaufort Sea as well as on shore that you will locate these kinds of deposits in your drilling.

A The formation or the potential formation of hydrate potential is not a function of whether it is on land or on sea, it is a function of the subterranean conditions.

Q And as land creatures we have to abandon our way of looking at the basin as an onshore and an offshore situation, except as it relates to methods of extracting and moving the gas and oil around, is that correct? Do you agree with that?

A I must confess that you misled me there because I got lost on one of the curves. Could you restate that, please?

Q Yes, I was just, it was a way of getting at a question I was going to ask a little later on but you have raised it that the Mackenzie Basin as such extends out beyond the beach into the Beaufort Sea.



Chapman, Lonsfield, Hutyka  
Cross-Exam by Bayly

A That's correct.

Q And the formations don't change dramatically at the beach line?

A Is that positive?

Q I am asking you that.

A No, I don't think that is an absolute statement.

They may change at the beach line.

A That's correct.

THE COMMISSIONER: They may change what?

MR. BAYLY: At the beach line. But again, they may not. They aren't dictated by the shoreline.

A That's right.

Q The only things that are significantly different from the point of view of production are the techniques that you have to employ for drilling and perhaps running feeder lines.

A That's correct.

Q Now, and that's why you say that we may encounter these same kinds of hydrates beneath the Beaufort Sea in some places that have been encountered on occasion on the land part of the Delta.

A Or in the high Arctic, yes, that's correct.

Q Right, I am just referring to this one basin right here now. If we can, I think we will just get confused trying to bring in --





Czaja, Horsfield, Motyka  
Cross-Exam by Bayly

4 A I would just like to make  
5 it very clear that what we are now talking about we,  
as producers, is an on land operation, and you sound  
like you are going off whale hunting and I am prepared  
to go with you but not today.

Q All right, well, maybe I  
can get Mr. Horsfield to go with me.

WITNESS HORSFIELD: You can try.

Q The encountering of these  
hydrates occurs at the discovery stage, the discovery  
well stage, would you agree with me there?

WITNESS MOTYKA: That's correct.

Q Would you agree with me  
that they may become a problem at the production stage  
rather than at the discovery stage, if they are warmed  
up by oil or gas coming out from deeper finds?

A Correct, if they were  
warmed up.

Q Right and when you go through  
them at the discovery stage, does that map them for  
you sufficiently that when you start to produce you can  
deal with them?

A Does it "mask", did you  
say?

Q Does it map them so that  
you are aware that you have gone through them?

A Generally speaking, yes.  
One of the areas that I am sure you are aware of we are  
very concerned about is the possibility that some  
prolonged production which, of course, could add heat



Cross-Exam by Bayly

to the hydrate bearing formation as you point out. Small volumes of gas could be generated that could escape to the surface. One calculation that I did on the back of a piece of paper which I think was reasonably indicative is that if we had a thaw zone of about 20 feet around the well bore, you might get 50 or so million cubic feet over a 20-year life. That's not an awful lot of gas but we do admit that that is an undesirable state and we are designing our facilities so as to minimize to a very few feet at most the ultimate thaw bulb around the well bore in the permafrost region.

Q Would you agree with me that these hydrates may be released by the heat into gaseous form which could cause or contribute to the collapse of a production casing?

A No, sir, I would not agree with you of that.

Q None of you agree with that.

WITNESS HORSFIELD: No.

WITNESS MOTYKA: Do you want an explanation or are you satisfied with that?

Q Oh no, I would like to know why.

A I think it would be the strength of the formation is much less --

THE COMMISSIONER: Maybe the explanation won't satisfy him.

MR. BAYLY: Well, it may satisfy the people that are listening. It may not satisfy me.



Cross-Examined by Bayly

A Basically the reason is that the casing design takes into consideration these sort of pressures and as a result, if such a situation arose where these gaseous volumes were generated to create the pressures you are talking about the formation itself would fracture before any kind of undue stresses are placed on the pipe. That is one area that is, I think, reasonably well, excellently well engineered.

Q So the real problem is that it will escape along the surface, the outer surface of the casing through cracks that may occur in the formation.

A That's correct and it has been a question of how far they provogate.

Q Yes, they may not come to the surface, they may find somewhere else to come to rest before rising that far.

A Yes.

Q Now, Mr. Horsfield, you stated at page 15 of your evidence what I have asked Mr. Motyka to address himself to, that the Mackenzie Basin extends offshore and that perhaps the best potential area of undiscovered reserves in the basin is offshore.

WITNESS HORSFIELD: In our opinion, yes.

Q Now, perhaps you can tell me whether you feel that this basin will mean that discoveries may well be made off the Yukon coast?

A There could be discoveries



Czaja, Horsfield, Motyka  
Cross-Exam by Bayly

off the Yukon Coast.

Q And are those areas where  
3 people are actively doing exploration work now, to  
4 your knowledge?

A There has been some seismic  
work done in the offshore, yes.

Q But there hasn't been any  
exploratory drilling to date.

A I don't believe so.

Q And as far as you know, no  
11 application for a permit to do so.

A No, I think I did hear or  
read somewhere that someone had proposed a well on  
Herschell Island at one time.

Q That was, was that recently?

A Pardon.

Q Was that recently?

A I believe it was in the  
last year.

Q Now, I take it that because  
of the seismic work that you have done offshore  
to date by looking at the formation, you can satisfy  
yourself that there are a number of formations that  
suggest the possibility of reservoirs with hydrocarbons.

A Yes, there are many structures  
that we can see on seismic offshore.

Q Right and these are very  
big structures, I understand.

A Some of them are fairly large.

Q Yes and you are drilling into





Czaja, Horsfield, Motyka  
Cross-Exam by Bayly

some of them right now?

A On the Artificial Islands?

Q Yes.

A Yes, we are drilling some.

Q And I take it that you haven't found hydrocarbons yet in these exploratory wells in the Artificial Islands with the exception of Adgo.

A We have found some gas and oil at Adgo.

Q But in the other islands, not.

A Not so far.

Q Where do you expect to find it, at approximately what depth?

A I believe the deepest places we have gone for so far is about 15,000 feet.

Q And if you don't find it at 15,000 feet, is your plan to go deeper or to abandon those sites and look at other structures?

A Well, we haven't gone, or proposed to <sup>go</sup> deeper yet. We may in the future.

Q You haven't got as deep as 15,000 feet as I understand your evidence.

A I don't know what our deepest depth has been. It has been around that.

Q Yes. So if there is anything in those structures, you will have to go deeper to find it, deeper than you have gone to date anyway.

A Yes.

Q And, there is no way of telling except because they are sandstone formations



Czaja, Horsfield, Motyka  
Cross-Exam by Bayly

whether or not you will find sulphur in association with the hydrocarbons located if there are any in these reservoirs?

A Well, I am not a geochemist, Mr. Bayly, but I have been advised that is highly unlikely that there would be sulphur in those reservoirs. I can't guarantee there won't be any.

Q Yes. And we have had that evidence from your witnesses earlier on as well. Now, at page 7 of your evidence, in the middle of the second paragraph, do you have it before you, sir?

A Yes.

Q You state that, "the pattern of well spacing used in the southern basin in Western Canada was dictated more by diverse land ownership than by efficient production practices." And do you see the possibility in the Delta of having to follow a well spacing pattern that is dependent on land claims?

A On land claims?

Q Yes.

A Well, I don't know about that, Mr. Bayly, there is no way I can tell.

Q You can see that parallel in your evidence from the questions I have asked, I take it.

A Well, it is hard for me to visualize how it might, how land claims might affect the well spacing.

Q You said that land ownership



Chapra, Horsfield, Motyka  
Cross-Exam by Bayly

down south had a great deal to do with the well spacing in Alberta as opposed to logical drilling techniques.

A Yes, Mr. Bayly, I am talking here about the 40 acre farms for example which sometimes dictated different well spaces. It is hard for me to visualize that in --

Q Oh, I see. I can understand you are not being able to visualize 40 acre farms in the Delta and particularly today.

A Particularly offshore.

Q Yes. Right, but you are not suggesting though that you may not be, that you, are you suggesting that the reason that the well spacing was illogical as compared with what you would have liked to have done in a technical way because the farms were so small.

A I am saying that the mineral ownership in the south was very diverse and if the well spacing in the south was more a function of that problem than of a reservoir problem.

Q Right.

A And I don't expect to see the situation occur in the north.

Q Well, what sort of initial pattern can we expect. It will be dictated but as you see it by the technical considerations rather than any other constraints that may be placed on the land or the sea if they are offshore finds but when you are looking at the basin, can you give us a picture of where you would be going in the logical evolutionary process. You are looking now as I understand in an





Czaja, Horsfield, Motyka  
Cross-Exam by Bayly

exploratory wells at a couple of formations fairly  
close offshore. Is that correct?

A I think we got away from  
the subject we were talking about of development  
spacing and you are now, as I understand it, talking  
about spacing of exploratory wells.

Q Yes, I am back to exploratory  
spacing rather than development spacing. The development  
spacing, if I understand you, depends on the formation.

A Correct.

Q And that's why Mr. Czaja, the  
Shell plan is different from the Gulf and Imperial  
plan. Is that correct?

WITNESS CZAJA: Yes, sir.

Q But as far as exploration  
is concerned and given that you have told us it is an  
evolutionary process, you must have done some planning  
though for where you would go next in the event of  
either finding or failing to find hydrocarbons off the  
offshore islands from which you are now drilling.

WITNESS HORSFIELD: Correct. We  
are going to follow the information that we get from  
exploratory wells which will lead us on then into our  
exploration program. Some of these wells might be a  
few miles apart and some might be several miles apart  
and I can't tell you right now just exactly where they  
will be.

Q So you don't know whether  
you will be going into deeper water or farther along  
the coast?



Czaja, Horsfield, Motyka  
Cross-Exam by Bayly

1 A No, I can't. I expect we  
2 will do both. I can tell you in the near term that  
3 we will be drilling or planning on drilling two islands  
4 north of Kugmallit Bay this next summer.

5 Q And in what depth of water  
6 are they?

7 A I believe one is in 28 feet  
8 of water and the other one is in 18 feet of water.

9  
10 Q These being shallow water  
11 areas, you must elect to build islands rather than  
12 contemplate drilling from drill shifts when which I  
13 understand you can't do except in deeper water.

14 A Yes, the islands are more  
15 economical in shallow water.

16 Q Right and with regard to the  
17 possible use of monopods, have you investigated them for  
18 the purposes of drilling these two --

19 THE COMMISSIONER: Possible use  
20 of what?

21 MR. BAYLY: Monopods, sir. I  
22 understand there's a drilling structure which is called  
23 a monopod.

24 A Yes, it is a free standing  
25 structure and we have looked at several kinds of  
26 structures to drill in the offshore but not these loca-  
27 tions. These locations were designated as island  
28 locations.

29 Q And is a monopod better for  
30 deeper water?



Czaja, Horsfield, Motyka  
Cross-Exam by Bayly

1 A It has its use in or perhaps  
2 will have its use in the deeper water.

3 Q Yes, none have been used  
4 in Arctic water as I understand to date, is that  
5 correct?

6 A Not in exploratory drilling.

7 Q Yes. Just before we leave  
8 the dictates of the formation, Mr. Czaja, at an earlier  
9 stage, I asked one of the witnesses about the Mackenzie  
10 Delta development system brochure that was put out by the  
11 three producers. Are you acquainted with this pamphlet,  
12 sir?

13 WITNESS CZAJA: Yes, sir, I am.

14 Q Now, in that pamphlet which  
15 I understand was issued approximately a year ago or  
16 so, it states that all the production would be done  
17 from series of clusters by a series of clusters they  
18 say, in the brochure; now when did Shell make its  
19 decision not to use the cluster system but to go to the  
20 traditional single production well and feeder line  
21 system back to the gas plant?

22 A Mr. Bayly, I really believe  
23 this question is probably answered in our technical  
24 information but I would like to back to this exploration  
25 and delineation type program that the industry normally  
26 face and we specifically faced at Niglintgak.

27 With a discovery well, we  
28 identified shallow structures and deep. Now, the extent  
29 and distribution of this gas, we couldn't determine  
30 until we made further follow-up drilling. With that



subsequent drilling which has taken time, we now find that we have got a significant amount of our gas at a shallow reservoir and this requires additional drainage points. It then became necessary that we abandoned , if you like, the cluster program because we couldn't drain the gas because of the faulting and the shallowness. This then required the number of wells that we have now specified so that indeed when that was prepared we were fairly early on in our delineation stage. Now, we are farther along and realize we require the number of wells that we have indicated.

Q I understand that, Mr. Czaja and I am not trying to fault you for this because I think that you must take the gas as you find it and develop the best system for extracting it. What I am concerned with is whether you pass the information on to the public to correct the information in this brochure when you knew what your change of plans was going to be and can you tell me that?

A Mr. Bayly, if you are in any way indicating that we are withholding information knowledgeably, this isn't the case. We drill very few wells. You know the drilling conditions that we operate under. We can only drill two or three wells a year. Just out of necessity, our information is slowly forthcoming. These wells are extremely expensive. We are now attempting to drill development wells. We have set these up so that they are capable of production. As our plans materialized, we did change





Czaja, Horstfield, Motyka  
Cross-Exam by Bayly

1 them. When we got on to this particular hearing and  
2 we had gone to the DIAND land use application, we  
3 indicated what our plans now were. We are that much  
4 further along in the learning curve, if you like.

5 Q So that was fairly recent, is  
6 what you are saying?

7 A Yes, it was.

8 Q Can you tell me when that  
9 was because I wasn't able to find it in your material,  
10 sir.

11 A I guess I tried to answer  
12 this thing, Mr. Bayly, these things don't happen  
13 immediately; as you gain information, study your well  
14 information more carefully, you gradually start  
15 developing the pattern of what that reservoir looks  
16 like and as we drill each subsequent well, our thinking  
17 gradually changes; we then realize what the final plan  
18 would apparently be. Now, we have indicated that  
19 ten wells to the best of our knowledge today on the  
20 basis that we have drilled, of the drilling that we  
21 have done to date, this is the development plan we now  
22 foresee. It may be modified slightly. I am not  
23 suggesting that it is carved in stone but I believe it  
24 is largely firm enough that we can go forward and say  
25 this would be our development plan as we now see it.

26 Q Now, would that development  
27 plan be for the extraction of the gas at shallow depths  
28 or would it include the gas at the deeper gas that  
29 you have indicated in your evidence exists at your  
30 location?



George, Horsfield, Motyka  
Cross-Exam by Bayly

A Both, both.

Q So you wouldn't then go  
to a cluster system to get the deeper gas at a later  
stage?

A No, we can use the same wells.

Q Can you outline for us, Mr.  
Horsfield, from your evidence at page 8, the problems  
involved in transportation of raw production fluids  
over long distances as they relate to offshore produc-  
tion. We have seen in the evidence how they relate  
to onshore production and the possibility of sagging and  
what it will do to form hydrate slugs, etc.

WITNESS HORSFIELD: It is a problem  
that will have to be looked at, Mr. Bayly, I don't know  
how it will be resolved.

Q You haven't got to that  
stage yet of knowing how the gas can be brought to  
shore from offshore production facilities, offshore  
producing wells.

A We haven't planned the  
offshore production in detail, no.

Q So if you find hydrocarbons  
at the island in which you are now drilling you will  
have to cap them off and wait until you can develop  
this. Is that what you are saying?

A Well, there are systems  
available and for example, I don't know whether we  
would attempt to pipe the raw gas ashore or whether we  
would attempt to process it on an island out by the  
discovery. It would depend on the circumstances.



Czaja, Horsfield, Motyka  
Cross-Exam by Bayly

Q And if it is a deeper find,  
I take it, it may be impossible to build an island.  
You may be faced with either shipping it to a plant or  
transporting it by flowline.

MR. BALLEM: Mr. Commissioner, I  
can't help but observe that Mr. Bayly is directing some  
very technical questions to this policy panel. We have  
had three technical panels on and surely that was the  
occasion to direct this sort of questioning. I don't  
think that these people are really the most appropriate  
or the most accurate ones to deal with this type of  
question.

MR. BAYLY: Mr. Commissioner, the  
only evidence we have had on offshore potential and  
plans is from Mr. Horsfield. It is for that reason  
that I am directing these questions to him, sir.

THE COMMISSIONER: Well, he seems  
to be able to respond. I'm going to let you proceed,  
Mr. Bayly.

MR. BAYLY: If he says he  
doesn't know, we will have to leave it at that  
sir. But the plans are in that state that any methods  
for bringing gas onshore from finds in deeper water  
have not yet been developed.

WITNESS HORSFIELD: They haven't  
been defined specifically, if that is your question.

Q What could they include?

A I presume our engineering  
department will be looking at that, Mr. Bayly. I can  
not speculate on it right now.





Czaja, Horsfield, Motyka  
Cross-Exam by Bayly

Q In the history you gave, Mr. Horsfield, and at page 13 of your evidence, you stated that the Eagle Plain appeared in the early days to be a basin that showed considerable promise but has not lived up to that promise and I paraphrased you. Would you agree that that is basically what you were saying about it?

A In effect, Eagle Plains had considerable sand in it and had an indication of some hydrocarbon at an early stage and that certainly is promising. It didn't live up to that promise.

Q Right. Now, I suppose there is a possibility that the three companies that were represented here had to contemplate that in fact the Beaufort Sea part of the Mackenzie Basin may fail to live up to the initial promise that has been held out for it. Is that a fair statement?

A There is that possibility. We consider it unlikely though.

Q Right. But people considered that unlikely I expect of the Eagle Plain in the early days. Would that be fair to say?

A Yes.

Q Would you all agree with that gentlemen?

WITNESS CZAJA: I am not familiar Mr. Bayly, with the reference to Eagle Plains but I would share that we are in a very preliminary stage of exploration; we feel the potential is there. Only time will tell what actually will be found. It is encouraging



Czaja, Horsfield, Motyka  
Cross-Exam by Bayly

1 of course, that oil and gas has been found along the  
2 shore and in the shallow water of the Beaufort Sea and  
3 the potential would indicate that there is potential  
4 for oil and gas offshore and that has largely been our  
5 position. We have attempted to forecast the potential  
6 that is available in this area.

7 Q Mr. Motyka?

8 WITNESS MOTYKA: I agree with  
9 what has just transpired.

10 Q And would you agree with  
11 me as a panel that --

12 THE COMMISSIONER: You would agree  
13 with what has just transpired --

14 A With regard to the, Mr.  
15 Horsfield's comment on the potential, that the basin  
16 potential is encouraging from an exploration point of  
17 view and that's the reason that we are looking forward  
18 to the day when we make significant finds.

19 THE COMMISSIONER: In the Beaufort  
20 Sea.

21 A In the Beaufort Delta Basin,  
22 that is correct.

23 THE COMMISSIONER: And Eagle  
24 Plains was only brought in to be dismissed. That is  
25 all we did with Eagle Plains, right?

26 MR. BALLEM: You should ask  
27 Mr. Bayly why he brought it up.

28 MR. BAYLY: I brought it in, Mr.  
29 Commissioner, because it is in the evidence of Mr.  
30 Ballem's witness on page 13 in the third paragraph.



Czaja, Horsfield, Motyka  
Cross-Exam by Bayly

1 THE COMMISSIONER: Let's not  
2 get into that but you dismissed it, Mr. Horsfield, you  
3 said, "well, there is nothing there."

WITNESS HORSFIELD:

4 A Our assessment of that basin  
5 is very low to answer your question directly and I--  
6 but to answer your first question I really don't know  
7 why he brought it in.

MR. BAYLY:

8 Q So you don't know why you  
9 brought it in to your evidence.

10 A I don't know why you  
11 brought it in, Mr. Bayly.

12 THE COMMISSIONER: Well, you  
13 brought it in, Mr. Bayly, and Mr. Horsfield dismissed it,  
14 so that's settled.

15 MR. BAYLY: Fine, I can cross that  
16 paragraph out of the evidence then, Mr. Commissioner.

17 Would you agree that some  
18 of the considerations that must go into the proposed  
19 location of pipeline facilities is whether they will  
20 be in the vicinity of potential finds of hydrocarbons?

21 WITNESS HORSFIELD: I presume that  
22 that is one of the considerations of the pipeline  
23 company, yes.

24 Q We have heard a great deal  
25 about the hiring of native peoples and the goals of the  
26 companies to provide a local dependable work force of  
27 whatever size is available for work in the hydrocarbon  
28 industry. Now, we have heard Mr. Czaja say that that  
29 is a goal of Shell and he has stated why in answer to  
30 a question by Mr. Bell. Now, in examining the hiring of



Czaja, Horsfield, Motyka  
Cross Exam by Bayly

1 native peoples for the hydrocarbon industry, could you  
2 tell us whether or not these goals were goals of  
3 government and industry together or whether these were  
4 purely goals of your company? Mr. Horsfield, perhaps  
5 you could respond. We have heard from Mr. Czaja on that.

6 A I believe they are a  
7 combination of both, Mr. Bayly. Our goal is certainly  
8 to, as far as the company is concerned, to live and work  
9 in harmony in the area that we operate in, and to  
10 interpret this that the people that want to work with  
11 us and for us, we will certainly do our best to arrange  
12 this. If they don't want to, we will do our best to  
13 arrange that as well.

14 At the same time, we are  
15 aware that the government has very specific social  
16 objectives which they have spelled out and we are obli-  
17 gated to operate under those objectives.

18 Q All right.

19 A And the objective is to,  
20 one of them is to maximize the amount of employment  
21 we can in the area.

22 Q I appreciate that and as I  
23 understand the NORTRAN program, it is an extensive  
24 program for industry. You have to spend a considerable  
25 amount of money and set aside human resources from your  
26 operations in order to train people who will eventually,  
27 you hope, be involved as employees of the various parts  
28 of the industry.

29 A Yes, it is a deliberate  
30 approach to meet our objectives.





Czaja, Horsfield, Motyka  
Cross-Exam by Bayly

Q Right and not just to meet your objectives but as I understand to meet the objectives that you have outlined are government objectives to provide wage employment in the Mackenzie Delta?

A Yes.

Q And would you agree with that, Mr. Motyka?

WITNESS MOTYKA: Yes, I would.

Q And with regard to employment if there were no government guidelines and no government policies to follow can you say whether it would be less costly to bring workers in who had the training required from Alberta or other parts of Canada?

A Mr. Bayly that is the sort of question of would you pay income tax if the laws of the land didn't demand it. I'm not sure I quite appreciate the relevance. What my two counterparts here have suggested to you is that this employment we have been talking about has resulted from a dialogue between industry and government that has taken place over a number of years and there is a mutual commitment to the objectives so to automatically elim--erase that is a hypothetical curve I am not prepared to accept because it is a fact it is with us.

Q Well, I accept then that what you are telling me is that this isn't industry falling into line with government guidelines. These are cooperations, this is an example of cooperation between government and industry to provide the opportunity



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Cross-Exam by Bayly

for employment for the people in the Mackenzie Delta.

A Well said.

Q And you would agree with that  
Mr. Czaja and Mr. Horsfield?

WITNESS CZAJA: Yes.

WITNESS HORSFIELD: Yes.

Q And well said, Mr. Motyka,  
means that you would agree with it, does it?

WITNESS MOTYKA: Right on.

Q Well, I have been reputed to  
say some things well that nobody has agreed with.

A I believe that too.

Q Okay, perhaps I could turn  
to you again, sir and I would like to address some  
questions to your policy with regard to public informa-  
tion at Imperial Oil and could you tell me in the  
first instance, is it the policy of Imperial Oil to  
respond to requests from the public for information on  
offshore drilling with disclosure of general plans for  
the region?

WITNESS HORSFIELD: Yes, it depends on what the  
requests are, of course.

Q And so you don't restrict  
this to people who are in the petroleum industry?

A No.

Q Right and I take it from  
that that you don't consider that the public information  
program is solely a function of government. You feel  
that industry should let the public know in general  
what its plans are?



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1 A Certainly there are  
2 somethings that are of a highly competitive nature  
3 that are confidential but in the main I think we have a  
4 program, certainly a policy of informing people as  
5 much as possible.

6 Q All right and I can  
7 appreciate that there are secrets that you want to keep  
8 from your competitors so that they don't scoop one  
9 of your finds or snuggle in close so that they can  
10 get at it too. Does Imperial Oil agree that with  
11 regard to offshore operations that there is, at least,  
12 a potential for serious adverse effects to the ecosystem?

13 A Yes. There is a potential.  
14 If you look at the worst possible case, the program  
15 that is carried out, I believe is adequate to handle it.

16 Q I am not suggesting that they  
17 will occur and I appreciate your making the distinction  
18 but there is a potential hazard that you must plan  
19 against.

20 THE COMMISSIONER: Excuse me,  
21 Mr. Bayly and Mr. Horsfield, I missed what you said.  
22 Did you say, If you postulate the worst possible  
23 case then the existing systems are adequate or  
24 inadequate to handle that?

25 A I meant to say, Mr.  
26 Commissioner that the systems we have now are  
27 capable of handling the operation safely. I agreed  
28 that in the extreme case that there is a potential for  
29 damage to the ecosystem.

30 MR. BAYLY:

Q Now, could you tell me





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what Imperial Oil defines as, and perhaps this is difficult to do completely because there may be some gray areas, what it defines to be within the definition of serious adverse effects to the ecosystem?

A I am not quite sure I understand your question. Could you repeat it please?

Q All right, let me give you an example. Or I will give you two examples. At the one end of the spectrum, you may have somebody inadvertently knock a 45 gallon drum of fuel off the side of a barge and it may leak into the Beaufort Sea and at the other end of the spectrum, you may have a serious oil blowout and somewhere in between, I am asking you if Imperial has decided what it means by a serious adverse effect to the ecosystem. Is there a line that can be drawn or things that are going to happen that you have said are not serious.

THE COMMISSIONER: Well, surely, they want to avoid all such accidents and they would be inclined to take rather more intensive precautions against the latter event than the former. I'm not trying to answer these questions for Mr. Horsfield and I, no doubt, would get him into serious trouble if I tried to, but I don't think that is getting us very far. Well, you comment on that question if you like, Mr. Horsfield.

A Well, as I understand your question, you want me to paint some kind of scenario that I thought might be harmful.

MR. BAYLY:

Q No, that doesn't have to be



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1 scenario, sir, what I am concerned with is that we  
2 have heard evidence from other witnesses at this  
3 Inquiry that say that spills of fuel oil are very  
4 likely to occur at some point in the construction of  
5 islands, pipelines, production facilities. That may  
6 not be something that one considers to be something  
7 with an adverse effect to an ecosystem. It may be a  
8 small problem that can be cleaned up or even if it  
9 can't, it won't have wide-ranging repercussions.

10 At the other end of the  
11 spectrum there may be the, what you call the worst case  
12 situation. There may be other things, there may be  
13 you may have isolated them to say look, Imperial Oil  
14 has got to have contingency plans for the following ten  
15 things and I don't know that and maybe that isn't the  
16 way to address yourself to the problem and please say  
17 so if that is the case.

18 A Well, we have considered  
19 all spills to be potentially hazardous and we take  
20 all the precautions we can to avoid them.

21 Q Now, when you say, all  
22 precautions, I take it that means all reasonable  
23 precautions. You are not going to abandon your  
24 exploration activities because somebody might spill some  
25 fuel.

26 A I would say that our  
27 program is oriented towards a hundred percent safety  
28 and it is done that way.

29 Q Say it again. That last --

30 A Our programs are designed



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Cross-Exam by Bayly

for a hundred percent safety and they are carried out that way.

Q Now, would you go so far with me as to say that there are some risks that you feel should be taken. They can be planned for in a contingency way and they can be planned against by having certain equipment available and by instructing people very carefully to reach this hundred percent safety goal that you have outlined for us.

A The point I was trying to make, Mr. Bayly, is that we do not knowingly take risks.

Q If that is the case, are you satisfied for example, with your contingency plans for the cleaning up of spills of toxic substances to aquatic ecosystems.

A You see the emphasis on programs, of course, is on prevention of a spill whatsoever and there are some oil spill cleanup material used in the event of spills but that is not where the main focus of the safety program is.

Q Now, do you quantify it in Imperial Oil the consequences of the potential of your offshore operations to cause problems? In dollar values or in anything like that?

A Do we quantify it?

Q Do you quantify it?

A We don't sit down and write down some dollar numbers, no.

THE COMMISSIONER: Well, do you do



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anything such as you did in the case of reserves? Do you, with respect to risks, do you classify <sup>them</sup> in anything like the way you classified reserves? Do you use numbers there? You said, "approved, it is 90% established that the oil or gas is there, likely 50-50 and ultimate potential recoverable was 10%." I have got that right, I think.

A Yes. We don't classify things in that manner. We do categorize wells as to degree of difficulty and we do use different equivalents and different procedures on different categories of wells. The offshore wells, for example, are the No.1 category and receive the highest attention but we do not attempt any of these operations in a manner of taking a risk.

They are fully designed to meet all of the consequences.

THE COMMISSIONER: I understand you are saying that as far as Imperial is concerned, you do not take what in other circumstances might be called a calculated risk?

A That's correct.

MR. BAYLY:

Q Following from that then, I would take it that Imperial Oil doesn't have a policy on the sacrifice that Canadian consumers should be willing to potentially make in order to get gas from the Mackenzie Basin and particularly from the Beaufort Sea?

A I don't have any numbers along that line.





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THE COMMISSIONER: Sorry, I didn't quite follow that, your question. Mr. Horsfield did.

MR. BAYLY: What I was asking Mr. Horsfield, Mr. Commissioner, was whether Imperial Oil had the policy on what sacrifices or potential sacrifices in terms of the ecosystem of the Beaufort Sea, the Canadian people should be willing to risk as a trade-off for hydrocarbons from the Beaufort Sea, and he said that he can't quantify that.

THE COMMISSIONER: I understand.

MR. BAYLY: But at some point, I would suggest that Imperial Oil has taken from the expressed need or the projected need for hydrocarbons from the Beaufort Sea that the Canadian public is willing to accept certain potential risks for the Beaufort Sea as trade-offs for the fuels that may be found there.

A Mr. Bayly, we are exploring in the Beaufort Sea and obviously we feel we can do it safely and in the public interest and I really don't see how we can go any farther than that. We obviously believe that we can do it safely and that the results will be in the public interest.

THE COMMISSIONER: Can I just ask you this, you say that in the extreme case, there would be serious damage to the ecosystem and the worst case presumably would be a blowout and the accumulation of large quantities of oil under the ice. Now, when you say that Imperial has taken that into account and does not feel that there is a tangible risk if I can use a neutral expression, are you talking about



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the systems that Imperial may have developed to prevent the blowout, or the systems that Imperial may have developed to cope with the spill after it has occurred or both.

I am just trying to pin this down a little bit.

A I think both, Mr. Commissioner, we, the precautions we have taken, we feel the program can be done quite safely. Certainly in the area we are operating in if we did have any unforeseen effect or blowout, for an example, <sup>it</sup> would not be so disastrous as to destroy the ecosystem. I cannot paint a scenario that bad, that I would say would be a preventative for drilling in the Beaufort Sea.

MR. BAYLY:

Q Mr. Horsfield, the reason I am asking this is that is to try and define the Imperial Oil policy towards their exploration and because they are going into uncharted areas as far as the industry is concerned, in some ways this is a frontier of development of a kind that is new in petroleum exploration. You would agree with that?

A It is frontier in exploration, yes.

Q Yes.

THE COMMISSIONER: And it is a frontier of technology as well, is it?

A Yes, it is, in some respects but I believe the, for example, drilling from islands is really no different than drilling from shore. It is a land based operation. There is ice in the area.



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It is really not that different.

MR. BAYLY:

Q But bringing the hydrocarbons to shore, for example, is something for which the technology may yet have to be developed to suit the conditions in the Beaufort Sea.

A I believe the technology is there, Mr. Bayly. It is just a matter of designing the technical system. That is the only reason I can't tell you which system would be used.

Q All right. Now, the reason I asked is that with regard to the questions I have been asking, you have given some preliminary answers to some of them in a letter that I have before me and I will ask that this be put before you and I would like to comment on it. I have a copy for you, , Mr. Commissioner, as well as one for Mr. Ballem. And it is a letter to Mr. Ken P. Sam who is research assistant, Northern Assessment Group, 53 Queen St., 1st floor, Ottawa, dated December 20, 1974. It is signed by you as Corporate Manager, Arctic and attached to that although I won't read it, information that was requested in a letter from Mr. Sam. The letter reads as follows:

"Dear Sir: Your request dated Dec. 4, 1974 for information about offshore drilling in the Beaufort Sea has been directed to my office. It is evident from the wording and nature of the questions that the author is unfamiliar with the petroleum business. I am concerned that simple answers without extensive explanation of the evolutionary





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exploration process could be more misleading than information-than informative-to a layman. If you wish to pursue this approach further, I would suggest that instead of embarking on a correspondence course with explorers, you might seek the services of professional petroleum consultants. I sense that the reason for your interest in our business is concern that some event might happen that could have a serious adverse effect on the ecosystem. If so, I want to assure you that we realize this and will continue to take every reasonable precaution. It would be most helpful to all concerned, if instead of trying to assess the potential of our operations to cause a problem you would, within your own area of expertise, seek to quantify the consequences in terms of more definitive than potential ecological disaster. You could simply postulate any scenario you wished; i.e. any numbers and location of Artificial Islands, any kind and timing of oil spills, etc. and estimate the corresponding potential cost to society. These costs could be expressed either in dollars, the universal medium for quantitative assessments or if you think it more meaningful in terms of the sacrifice Canadian consumers of energy should be willing to make in order to ameliorate the



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environmental risk in the Beaufort.

Then we and the regulatory authorities would have a more tangible basis for design<sup>and</sup> approval of offshore facilities and programs. This kind of constructive approach would help us all to use our money and effort more effectively."

And then it is signed by you, sir.

THE COMMISSIONER: You omitted the last paragraph.

MR. BAYLY: I am sorry. "Compliments of the season."

WITNESS MOTYKA: If you are making corrections. Also, the third last line didn't include the word "Sea".

MR. BAYLY: I beg your pardon, sir.

A The third last line, the fourth last line did not include the word "Sea". It is talking about the Beaufort.

O Oh, "in the Beaufort". I am sorry.

A There is a distinction.

Q Yes. Now, there were some things that I didn't understand in that letter and they were things that I was trying to ask you through a series of questions and one is how you assessed the costs to Canadian consumers in dollars and you said your company hadn't done that and were you looking to



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somebody else to do that?

WITNESS HORSFIELD: Yes. Let  
me mention, first of all, Mr. Bayly, that this letter  
was in response to the one I believe<sup>that</sup> is probably  
attached.

Q Yes.

A But also followed up from  
discussion which the gentleman had with our, with a  
woman in our Ottawa office and I, both pieces of  
information came to me, the subject of the discussion  
and the letter and that is why some elaboration of this  
letter appeared and yes, the point I was getting at  
was it is a very difficult thing to quantify some of  
the environmental problems and as a result it is very  
difficult to balance the income, if you like, from  
petroleum resources and the potential hazard in  
quantitative terms. And what I was suggesting here  
was that we would like to see somebody do it and if  
he could do it, it would be most helpful.

Q Yes, but you weren't  
suggesting that the company was doing this but you  
suggested that it might be a helpful thing to have done.

A Right.

Q And you have pointed out the  
difficulty. Are you saying that you feel though that  
it would be possible to do this in dollars?

A I suggested it might be.  
It would be helpful if it could be done because then  
it could be compared directly with the other side of the



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equation.

Q But you have also offered an alternative of the things that the Canadian Society should be willing to risk, if I may use that word, as another thing that can be put into the equation although you can't necessarily directly equate that with petroleum resources.

A If I follow your question, yes, I was trying to say that if you can get risk involved, in a probability sense then perhaps it can be looked at more intelligently.

MR. BAYLY:

Mr. Commissioner, I wonder if this would be an appropriate time for coffee.

THE COMMISSIONER: Okay, fine.

(PROCEEDINGS ADJOURNED FOR A FEW MINUTES)





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(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

MR. Bayly: Q Mr. Horsfield, earlier in our cross-examination we were talking about monopod drilling systems, and you stated that there may be a use for those in the Beaufort Sea. I gather you haven't figured out just where or in what circumstances you'd want to use these.

WITNESS HORSFIELD: Well, several systems are being investigated, none of them proposed yet.

Q Now, what I'm concerned with, and I'll have to ask you to come along with me to one of these worst case situations again, and that is in the case of a blowout from an offshore island. Now, as I understand it takes quite a long time to build an offshore island.

A It takes - we built some in less than a month, and others it's taken a year.

Q And that is a function, I take it, of depth and availability of material close by.

A Yes.

Q Now, if you were faced with a blowout, I gather there are several options, but the main point is that you want to drill a rescue well, if we can call it that. That may not be the correct term, but you have to drill an additional well. Is that correct?

A There are cases in the extreme case that you're talking about where relief



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wells are necessary.

Q Yes, that's the term,  
relief well. And I gather some of those could, say in  
some cases a relief well could be drilled from the island  
island.

A Well again, that depends  
on the <sup>exact</sup> circumstances, but <sup>again</sup> if you're looking at the  
worst case, which I presume you are still, then it's  
unlikely.

Q You've probably lost the  
usefulness of your island because of the blowout.

A Yes, in those extreme  
cases, yes.

Q Now if it was in deep  
enough water, you could use a drill ship, provided it  
was open water season, to drill a relief well from.

A Yes.

Q And if it was shallow  
water you would be faced with having to build an island  
in the vicinity of the island where there'd been the  
blowout.

A Yes.

Q Or you might have to go to  
one of these other systems, and an example of that  
would be a monopod.

A Yes.

Q And I take it, from what  
you say, that there are others.

A Pardon me?



Q That there are other systems, mechanical structures?

A I think there are other systems being looked at, and designed.

Q And they would be things other than monopods?

A Yes.

Q What would they include?

A Well, I'm not aware of all of them, but there are some that are, in effect, steel islands. Just circular steel islands.

Q Right. And are they easily transportable, or have they not got to the stage that you'd be able to say?

A Well, they're still under design, but in some cases they float.

Q So they could be brought in almost like a barge?

A Yes.

Q Now, have you contemplated the need in your contingency plan for having one of these systems, either monopods or floating metal islands, or perhaps there are others, as a backup system?

A Where we are drilling, Mr. Bayley, the backup system would obviously be another island.

Q When you get into deeper water, then you're getting into longer periods for constructing islands, and you might well want to use one of these other systems as your backup.





A Yes. Although we don't have any immediate plans for that.

Q I understand that, and I accept this against the backdrop that your exploration is an evolutionary process and you can't tell where you're going to go next. But these are possibilities?

A We have control of where we go next, Mr. Bayly.

Q I didn't mean to suggest that you didn't, but you don't know where you would construct your next series of islands until you find out what there is below the ones you're working/<sup>under</sup>now.

A That's correct.

Q Now as I understand these monopods and as they have been discusse , they could be moved into place more quickly, in a period of a month, which you suggested is the shortest time in which an island could be built.

A Yes, I'm not an expert on monopods, Mr. Bayly; I know that they have been looked at, and that's about the extent of my knowledge.

Q Have they been looked at as backup systems, or as independent drilling platforms?

A I believe they were looked at as independent drilling platforms.

Q So, would I be correct in saying that the possibility of their being used as backup equipment has not been yet explored?

A Well, they haven't been built yet.



Q I realize that, but sometimes before you build something you think of what you want to build it for.

A Well, they have been built as drilling systems.

Q Yes. But you haven't contemplated building one to use as part of your contingency plan?

A No.

Q And would that apply of these floating steel islands as well?

A Well, they haven't been designed directly for that purpose. The point I'm trying to make is they're being designed as drilling systems and they could be used as backup systems, if necessary.

Q If they were going to be of any use to anybody in a blowout situation they'd have to be close by, I take it?

A They'd have to be available, yes.

Q What you're saying to me is it's faster to build an island than to design and build a monopod or a steel island.

A Certainly.

Q Take these systems like monopods to governments to see if they are approved structures from which to work either in exploration drilling, production drilling or my possibility of contingency work?



A Yes, I believe all structures, drilling structures and so on, have to be approved by government before they can be used.

Q With regard to the progress that you make on deciding whether to go ahead and build any of these things, do you go and ask for government tentative approval of the design first, or do you go ahead and build one and let the government have a look at it?

A Oh certainly we take the designs first.

Q Have you done that yet?

A I can't be sure. I don't know.

Q But somebody in your company would know.

A Yes.

Q And I wonder if that information could be made available?

A Yes.

Q I understand there has been approval of a number of systems, including the Imperial monopod, but you'll be checking that out, and they include that, and the Beaufort Sea task force and Hunt's ice-strengthened drilling barge, and Dome's ice-strengthened drill ship. Can you tell us anything about those, either the drilling barge or the drill ship? Are these systems that you've investigated?

A I know about such things as drill barges and drill ships but I don't know about



these specific ones, no.

Q Now, I take it you've built islands in water as shallow as 10 feet deep, or approximately 10 feet, and Immerk is an example of an island that has been built at approximately that depth, is that correct?

A Which island?

Q Immerk? Oh Immerk.

A Immerk was I believe in about 8 feet of water.

Q And, you have plans for Issigak Island at approximately 40 feet.

A I believe we did apply for an island called Issigak, we have no intention of building that one right now.

Q Have you developed any idea of how long it would take you to drill a relief island beside an island in 40 or so feet of water?

A If it was necessary to build an island quickly out there, I'm sure that all equipment would be dedicated to that job, and the second island would probably be built faster than the first one for that reason.

Q Right.

A How long this would take I couldn't estimate right now. How long it would take to drill the well would of course depend on how deep you have to go and the exact circumstances.

Q Could this be done in the winter, the construction of the relief island?





A Yes, we're building one right now. Not a relief island, an island.

Q You'd have rough ice problems, I take it, as you go farther out into the Beaufort Sea.

A Rough ice?  
for

Q Yes, /the hauling of materials, gravel, crushed rock.

A We'd have to haul it out over the ice. Yes.

Q Let's move to the question that I dealt with briefly with some of the other panels that have been presented by the producers. That is the question of abnormal geostatic pressures.

Now, I gather that at Emmerk the drilling was abandoned, and was that because of the abnormal pressures, or was it for some other reason?

A It was because we encountered high pressures, <sup>that</sup> we abandoned the well where we did, yes.

Q Now --

A That was not entirely unexpected.

Q In fact, you found those high pressures at about 8,800 feet. Do you agree with me there?

A I don't recall the exact depth but it was somewhere around there, that we encountered the abnormal pressure, yes.

Q And would you agree that



you had originally thought you wouldn't encounter it until about 10,000 feet?

A Well, I don't recall the exact circumstances on that well.

Q Looking here at a document which is from the Emmerk contingency plan, under Item 1330, Preplanning For Emergencies, there's a paragraph here which I'll read to you,

"Analysis of available velocity data indicates that pressure above a depth of 10,000 feet will be normal, and equivalent to a salt water gradient. Nevertheless, all pressures will be monitored continuously from surface to total depth in this well. Safety practices will be emphasized, and sufficient intermediate casing strings will be run to ensure that irrespective of depth, the well can be shut in immediately. Any hydrocarbons are recovered at surface."

That indicates that you felt that up to 10,000 feet depth, you were prepared to take all the precautions, but you didn't anticipate running into these abnormal pressures. Would you agree with that?

A I believe that's an excerpt that you have there from our application, Mr. Bayly, and I believe if you read the rest of it, it anticipates high pressures, in the program. If you look at the drilling program part of it you'll see that it anticipates the high pressures, I believe at a depth of somewhere around 7,000 feet.

Q I'm not suggesting that



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you didn't expect to arrive at some abnormal pressures  
that  
in this area. You had/analysed pretty well. I'm just  
suggesting that you thought that they wouldn't  
necessarily occur in the first 10,000 feet.

A Well, I'd have to look  
at that application but I believe ou'll find, if you  
look in it, that the program anticipated it at somewhere  
around 7,000 feet.

Q But perhaps you could  
check that at a later time, and if I've misinterpreted  
us through  
it, you could tell/your counsel.

A The important thing to  
look at, Mr. Bayly, on those programs, is the drilling  
program, or on the licence rather, is the drilling  
program.

Q To determine whether or  
not the proper precautions have been taken to ensure  
that blowouts don't occur?

A That's right.

Q Going back to what you've  
just stated, it appears that a report by Mr. Daw of  
your company, suggested that you'd start to find  
overpressure at 7,600 feet. I'll read you that  
paragraph because it seems to shed some light on where  
we were having our difference.

"Seismic indicated overpressure at Emmerk, and  
its depth and severity were predicted from a velocity  
plot, using background curves from the Gulf coast.  
Imperial took into consideration that these curves tend  
to under-rate Beaufort conditions. The overpressure





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was estimated at 7,600 feet, and was expected to be severe, calling for at least 16 pounds per gallon pore pressure equivalent. The condition demanded an effective pressure monitoring program."

And this is what you're saying, / anticipated beforehand that somewhere around the 7,600 foot level you would start to encounter these very high pressures.

A Yes. As I recall, the seismic indication at that time was that there would be high pressures at about that depth. However, I hope you appreciate that seismic gives you an indication of the possibility of pressures; it is not a conclusive device, or it's not one that's relied on completely for high pressure drilling.

Q And I take it that you got as far as somewhere around 8,800 feet before you felt <sup>that</sup> the pressures were so high, <sup>and that</sup> / the dangers were too great, <sup>that</sup> and / you would have to abandon?

A Yes. The pressure - I've forgotten just how high it got at that point - but it did get to the point where we decided to abandon the well.

Q And in a document from the Imperial Oil review called "Diary of A Dry Hole", the first sentence is,

"Last December Imperial announced that a well drilled from its artificial island in the Beaufort Sea was abandoned at 8,883 feet when the drill encountered formation pressures that made further drilling unsafe."



Exhibit 100-100, 100-100  
Exam by Bayly

That would reflect what  
you've just said?

A Yes. Another point about  
abnormal pressures, that word is usually misinterpreted.  
"Abnormal pressure" means that <sup>of course,</sup> it's different from a  
salt water gradient, and the word "abnormal" is not used  
to mean that it's not usually encountered, because  
in a delta basin it is usually encountered.

So in hydrocarbon industry  
terms, "abnormal" doesn't mean unusual, it means higher  
than a certain level.

Pressure gradient. Correct.  
Which is not unusual.  
Not unusual in a delta  
basin.

Right. But when it gets  
too high, it becomes unsafe.

Yes. When the pressures  
get too high, you have to drill any further.

And when you entered into  
the program of drilling from this island, you entered into  
it, I suggest, knowing that there were risks that you  
would have to abandon.

We anticipated high  
pressures, yes.

Q And you felt it was  
worth making the expenditure, and I understand the  
expenditure was quite large, to see if you could get  
beyond those depths safely, and find out if there were  
hydrocarbons beneath.



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Cross-Exam by Bayly  
Cross-Exam by Goudge

A Yes. When you drill a well, Mr. Bayly, there are usually several targets that you are going for down the well bore, it's not always just at the bottom of the hole. We did go through some of these zones, but encountering high pressure where we did prevented us from going deeper to the deeper targets. It was a useful well.

Q It told you a lot about what you'd gone through already.

A Yes, it added considerably to our geological knowledge.

MR. BAYLY:

Those are all the questions I have of this panel. Thank you very much, gentlemen.

CROSS-EXAMINATION BY MR. GOUDGE:

Q Let me deal with some slightly different areas, and then come back to approach the evolutionary nature of development offshore. First of all let me touch on a matter that I raised yesterday as a policy matter. I read yesterday from a report of Dr. Gunn's which suggested that for certain reasons, he preferred the gas plants that you speak to to be located on what he referred to be the mainland, southeast of Inuvik. Do any of the companies have any policy which would say if that were required, the gas plants would not be built?

WITNESS HORSFIELD: I guess if we couldn't get a permit, the plant would not be built, but we would proceed to talk about the permit in that situation, and hope to overcome any difficulties we



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encountered, but certainly if we don't get a permit,  
we can't build a plant.

Q Yes sir, but if the permit  
required that the plant be built there, you would  
build it there rather than not build it at all.

WITNESS MOTYKA: Again Mr.  
Goudge, you're leading us on a curve that isn't, I  
suggest, very practical. There are some very  
significant technological difficulties involved with  
following that scenario that you're trying to paint,  
and we believe that the regulatory agencies that we're  
dealing with are knowledgeable enough in this area  
that there's a low probability that that particular  
condition will be placed on us. The difficulties that  
we've been talking about for the last couple of days  
are compounded multifold by the type of arrangement  
that you're suggesting.

Q I appreciate, Mr. Motyka,  
the difficulty we're under. That's perhaps symptomatic  
of a number of issues that have arisen before this  
inquiry. We are trying to deal with hypotheses, in  
the future, in a number of areas; but if you will, for  
a moment assume with me that the plants can be built  
following Dr. Gunn's recommendation, only on the  
mainland. Do any of the companies have a policy  
which says, "Given that, we will not proceed with the  
gas plant? "

WITNESS HORSFIELD: We don't  
have a policy to that point. It would be a technical  
study that would have to be made, that we haven't done





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1 yet.

2 Q A technical study,  
3 presumably followed by some kind of business decision?

4 A Yes.

5 Q And there's no corporate  
6 policy in any of the companies that dictates the result  
7 of that business decision at the moment. Mr. Horsfield,  
8 you've answered. Mr. Motyka?

9 WITNESS MOTYKA: With the  
10 conditions that you've placed on it, yes, you are  
11 correct. Gulf does not have a policy that eliminates  
12 that item that you identified.

13 Q And Mr. Czaja?

14 WITNESS CZAJA: Mr. Goudge,  
15 I don't think that really this should be categorized  
16 as a matter of policy. In our particular application,  
17 we're dealing with a situation, and really it was  
18 described by the Commissioner and Mr. Ballem yesterday,  
19 I believe, that we'd have to examine the entire project.  
20 It would require a re-examination of the project. We  
21 are proposing our plant to be located at Nig for very  
22 specific reasons: we think it's a good site, we  
23 realize we require compression early in the life, and  
24 as we examine the problems of moving that plant and  
25 requiring additional flow lines, we think, in our  
26 judgment, and this is why we made the application in  
27 this way, that having the plant at Nig is the best spot.  
28 Now, I imagine you can paint various scenarios like  
29 Dr. Gunn has, that I presume you folks are examining,  
30 but in our view, the trade-offs that have to be made



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1 the best site is at Nig.

2 Q I understand that, sir.

3 My concern is to get from you the company's position,  
4 if you will grant my assumption for the moment, that  
5 the gas plant could only be built on the mainland.

6 A We would have to examine  
7 then in the total light of the economics and all the  
8 other matters that I referred to.

9 Q So what you're saying  
10 is, there's no present company position that says,  
11 given my assumption, the gas plant will not go ahead?

12 A That's right.

13 Q One other area that I'd  
14 be interested in your individual corporate views on,  
15 concerns employment. There's no doubt, Mr. Horsfield,  
16 that as these projects go ahead, there will be a  
17 winding down, perhaps, of the intensive construction  
18 programs in Alaska. Do you agree with that?

19 WITNESS HORSFIELD: Yes, I  
20 expect so.

21 Q And there may well be a  
22 substantial surplus of northern trained construction  
23 men at work in Alaska who are phasing out of their  
24 operation?

25 A Yes, that's possible.

26 Q Does your company have  
27 any policy that would dictate against the hiring of  
28 those people to fill the jobs that will be available  
29 to construct and operate your gas plant and gathering  
30 line system?



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A We don't have a written policy to that extent, but our approach would certainly be to use people within Canada first.

Q In other words, you would be hiring Canadians where at all possible?

A Yes.

Q And only when Canadians were unavailable, would you seek employees from other countries?

A Yes.

Q Mr. Motyka, what about Gulf?

WITNESS MOTYKA: Rather than just say me too, the only thing I'd like to add to it is that <sup>we do have and</sup> we have filed a letter of intent with the Minister of Indian and Northern Affairs, that in these matters it our intent to provide employment opportunities preferentially to northerners. If we have people of equal quality, we will in fact give preferential employment opportunities to the northerner, and that is on record.

Q I'm going to come to northerners in a moment, but we're dealing first with Canadians as opposed to non-Canadians.

A The term is used Canadians, and then goes on specifically to differentiate between a northern Canadian and another Canadian, whomever they are, as you and I.

Q Yes. But your company would adopt the position as Imperial, that you will





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1 employ non-Canadians only where there are no Canadians  
2 available to fill the position?

3 A If that situation arises,  
4 yes.

5 Q What do you mean, "if  
6 that situation arises"?

7 A Well, you are raising  
8 the hypothetical situation that suggests there's a  
9 deficiency of Canadian manpower for some particular  
10 activity. If that materializes, then we have to find  
11 the resource somewhere, and it might well be from  
12 Alaska.

13 Q Yes. Mr. Czaja?

14 WITNESS CZAJA: I would  
15 generally agree with what's been said, Mr. Goudge.  
16 I should point out that when you raise the prospect of  
17 Alaskans being available, these are pipeline people,  
18 primarily. In our particular case, we are dealing  
19 with gasplants, and we would very definitely be  
20 employing Canadians if at all possible. At the  
21 particular time that we're constructing, should there  
22 be a shortage, we would obviously then have to go  
23 non-Canadian. But our intent would be to clearly be  
24 using Canadians.

25 Q Now, to come down to the  
26 distinction between northerner and non-northerner,  
27 and by "northerner" I mean resident north of 60, what  
28 would the corporate policy be of your company, Mr.  
29 Horsfield?

30 WITNESS HORSFIELD: Our policy



is definitely to give preference to northerners.

Q And does that mean hire them, and hire others only where there are northerners not available to do the work?

A For the specific jobs, you have to do this by job rather than by total numbers--

Q Yes.

A Where the people are available and qualified, we would certainly take northerners first.

Q Yes. Mr. Motyka?

WITNESS MOTYKA: Right on.

Q Right on. Mr. Czaja?

WITNESS CZAJA: I think I would agree with the statement, but one thing I would like to add of course, that you are talking about the construction phase, and as we pointed out this morning in the socio-economic, <sup>are</sup> we/dealing with construction that, in all likelihood, there would be folks brought in from the south to do the work. If there are northerners available, trained, and this is of course what we're trying to do, they would certainly get preferred treatment, and this would be our intention. But I just want to make sure that you appreciate that in the construction, and the crafts that are required, we don't think there will be many northerners trained at that time.

Q Your reason for predicting southerners being involved in the construction phase is the absence of a sufficient number of trained northerners?

A Yes.



Q The policy you spoke of,  
and I take it you concurred with Mr. Horsfield and Mr.  
Motyka, is one that applies not only to the construction  
phase but also to the operation phase of your project.

A Yes.

Q Now, there's no doubt,  
I take it, Mr. Horsfield, that as a result of the  
development of which your company's projects are a  
part, there will be a growing demand for additional  
infrastructure in communities, particularly in the  
delta. Do you agree with that?

WITNESS HORSFIELD: Yes.

Q And by "infrastructure" I  
refer to housing, hospitals, schools and that kind of  
thing.

A Yes.

Q Does your company have  
any policy as to cost-sharing between yourself and  
government of the cost of that infrastructure?

A Sir, we view this part  
of the problem to be primarily a government problem, and  
that we'd look to them for most of the work and effort  
and money on that kind of thing. I'm talking here  
about different levels of government, municipal and  
territorial and federal.

Q Well, let's take it at  
the municipal level. Does Imperial have a policy that  
would indicate that it is prepared to share the cost  
with the municipality of infrastructure that may be  
required in that municipality, if it's a municipal



responsibility?

A Well we don't have again, a written policy that way, Mr. Goudge, but if anything, any project comes up involving things like hospitals and so on, then we would certainly consider it with government. But we would see them as being the prime one responsible for that project.

Q And by responsible, I take it you mean government would be the primary funder of that?

A Yes, <sup>as</sup> in any other community, and any other type of operation, any other kind of development.

Q I take it you're not ruling out the possibility of your company participating in the financing of such infrastructure developments.

A That's correct. We'd be prepared to talk to the various governments involved.

Q I take it from what you say though that you do not view yourself as an equal partner with any level of government in providing the necessary infrastructure consequent on the development?

A That's right, although I wouldn't like to make that statement completely general, in calling it any kind of infrastructure. We may have <sup>some</sup> involvement in/parts of it. Here I'm thinking of parts that might be necessary strictly for our business alone.

Q Can you give me an example? What about an airstrip?





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1 A Well, that kind of thing,  
2 depending on where the airstrip was placed, of course.

3 Q Or housing for your  
4 individual employees?

5 A Yes, we do handle that  
6 problem now, in other parts of Canada, by assisting  
7 employees.

8 Q I'm going to give you one  
9 other example. What about a sewage plant for a  
10 community in which your people are involved?

11 A Well, in which our  
12 people are involved, if it's within the community,  
13 I believe that would be a community function, if it's  
14 somewhere just for us, I think it would be our function.

15 Q Mr. Motyka, can you  
16 respond with Gulf policy on that issue?

17 WITNESS MOTYKA: Mr. Goudge,  
18 these areas that you're exploring are the same areas in  
19 which we, and our friends here who've been talking to  
20 various individuals, basically the territorial and  
21 the federal level, with casual conversations at the  
22 municipal level, but primarily the two senior  
23 governments, in expressing an area of mutual concern.  
24 We propose to keep them, to the best of our ability,  
25 knowledgeable in what our intentions are. As Mr.  
26 Horsfield has pointed out, the government - it isn't  
27 an equal partnership. We are obliged to live by the  
28 approvals that they grant us and I suspect that to the  
29 effect that government funds are yours and mine, that  
30 the government will elect to advise how the infrastructure



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1 will be financed. I don't suggest for one minute that  
4 Gulf Canada is going to lay down X number of millions  
2 of dollars to build a sewage system, for example.  
4 But I wouldn't be at all surprised that the overall  
5 development of this area will be such that the  
6 government will arrange a financial agreement that will  
7 be mutually agreeable to all concerned. They have a  
8 pretty big stick as you're well aware.

9 Q Let me put it another  
10 way. Do you view it as in any sense a Gulf responsibility  
11 to share in the provision of infrastructure necessitated  
12 by the development of which you're a part?

13 A Do I believe in  
14 motherhood? Yes, I do.

15 Q So that would indicate to  
16 me that you would be willing to shoulder some of the  
17 financial burden required to create that infrastructure.

18 A I have to answer in the  
19 positive. The conditions you set up are - you just  
20 can't contest them-

21 Q Even if you want to.

22 A Even if you want to.

23 Q Mr. Czaja, what about you  
24 and Shell?

25 WITNESS CZAJA:

26 A Mr. Goudge, I think we  
27 have a very definite responsibility of providing to  
28 government at all levels our best estimates of the  
29 plans that we've got, the numbers of people that would  
30 impact in any area, in any municipality, and <sup>an</sup> attempt to  
work effectively with that particular group, whether it's



1 a council or the developing municipality. I can relate  
2 past history, where indeed we have done this. Our  
3 normal support, if you like, as we move into a new area  
4 where the support facilities are deficient, is that we  
5 will normally get into the housing sort of thing. We  
6 will provide housing support in some fashion.

7 When you talk about an airstrip,  
8 our normal requirement is to provide information to the  
9 Ministry of Transport, and from this I presume, the  
10 Ministry has a good knowledge of the impact and the  
11 requirement to, say, expand facilities. Normally with  
12 our people coming in, particularly on a planned basis,  
13 I believe the municipality can then forecast the  
14 revenues that they'd be getting to allow for the  
15 expansion. Certainly if it gets down to the point where  
16 there are real difficulties with it, we'd be prepared  
17 to sit down and work with these people.

18 Q Sir, let me come to  
19 native employment, having dealt with Canadian and  
20 northern employment. As I understood, the socio-economic  
21 panel, the policy of each of your companies is basically  
22 to provide an opportunity for wage employment for  
23 those natives who wish to take advantage of it, and  
24 thereby add to the range of options open to them.  
25 Would you agree with that capsulization of it?

26 WITNESS HORSFIELD: Yes.

27 Q Should it prove to be the  
28 case, and here you'll have to come with me on an  
29 assumption that your development narrowed some options,  
30 not the wage economy options, but some options, that





are presently available to natives. Would that cause you some concern in the light of the thrust of the policy I've outlined?

A I'm not sure I follow you. You say that if our activity narrowed the options?

Q Suppose it was determined that your activity in fact shut off some options that are presently available for natives. Would that cause any substantial rethinking of your proposal?

A I guess my difficulty, Mr. Goudge, is I can't think of an example. Do you have a specific example in mind?

Q Well let me give you an example of - perhaps <sup>it's</sup> difficult for both of us - but let me give you the example of simply living off the land. Suppose that became more difficult as a result of your proposal?

A Then I'm sure we'd want to take another look at it and discuss it with everyone involved to see whether <sup>or not</sup> this could be done. But I can't categorically just say that we would not do something because of that.

Q Yes sir. Mr. Motyka would your approach be much the same?

WITNESS MOTYKA: Well I'm not really sure I understand your question, so I can't agree with what the approach is. Are you suggesting that something we will do will cause some individual or group of individuals to not have the capability of living off the land, because of our moving into the delta?



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Q Yes, make that assumption with me. I'm not asking you to agree with that, but make that assumption.

A Okay, I didn't understand that completely. And the question was what, would we reconsider --

Q Would that cause you to rethink your development plans?

A Definitely.

Q Mr. Czaja, would that apply to Shell?

WITNESS CZAJA:

A I think so, Mr. Goudge. It's a very hypothetical situation. As we see it, it shouldn't be affecting the native people.

Q I understand that, that's why I asked you to --

A Now whether it really affects the plan, as we proposed it, or whether we would try to work with the folks that were denied the opportunity of living off the land try to work some other arrangement, I'm not so sure that we'd simply attempt to abandon the plan. I would hope that we could, with the people affected, with the government authorities, attempt to resolve the issue.

Q I'm not asking you to agree with the assumption, but I appreciate your comments on the policy in reaction to it.

Mr. Horsfield, let me ask you this. Does Imperial have any corporate policy for the delta area concerning the development by it or its related companies in the delta of secondary industry?



Ozain, Horsfield, Motyka  
Cross-Exam by Goudge

1 WITNESS HORSFIELD: We do have  
2 a policy of trying to support and develop as many  
3 local industries as possible.

4 Q I'm speaking of hydrocarbon  
5 based industries.

6 A You're talking about  
7 petrochemical plants?

8 Q A refinery, a petro-  
9 chemical plant and so on.

10 A You asked for the  
11 corporate policy, and I would say that our policy is  
12 that we build those plants where it's economical to do  
13 so. It's quite likely that they would not be built in  
14 this area. I'm talking about refineries and things  
15 like that.

16 Q The company is not at  
17 present intending to move in that direction?

18 A No. We'll look at any  
19 economic prospect that comes up, but we do not have any  
20 intention right now of doing that.

21 Q Mr. Motyka for Gulf?  
22 WITNESS MOTYKA:

23 A You're talking about a  
24 refinery now, or a petrochemical operation?

25 Q Those are two examples of  
26 hydrocarbon based secondary industries.

27 A For those two there are  
28 no plans at this time, and I would personally doubt  
29 there would be any in the distant future, for those  
30 type of facilities in the delta.

31 THE COMMISSIONER: You doubt if



Czaja, Horsfield, Motyka  
Cross-Exam by Goudge

1 it would occur in your lifetime or mine?

2 A Precisely.

3 MR. GOUDGE: And your doubt,  
4 I take it, is based on economics?

5 A That's correct.

6 Q Any other major factor on  
7 which you base your doubt, besides economics?

8 A No, basically on economic  
9 viability.

10 Q Mr. Czaja, for Shell?

11 WITNESS CZAJA: We have no  
12 plans.

13 Q And would you agree with  
14 the reasoning of Mr. Motyka as to why it won't happen?

15 A If, Mr. Goudge, within  
16 the context of economics, the demand is included in  
17 that, and the problems of generating chemicals or  
18 refinery products in this area with the very limited  
19 demand at this time, then yes, I would agree, that the  
20 economic viability is what we're speaking of.

21 Q Now let me move very  
22 briefly to the area that Mr. Bayly canvassed, somewhat  
23 early, there's no doubt, as I understand it Mr.  
24 Horsfield, that exploration and development of the  
25 hydrocarbon extraction business is extending from the  
26 delta gradually out into the Beaufort Basin. Would you  
agree with that?

27 WITNESS HORSFIELD: Yes.

28 Q And that that is an  
29 evolution that is substantially enhanced by the  
30 building of a transmission facility such as the





CHIEF, Hon. [REDACTED], [REDACTED]  
CROSS-Exam by Goudge

1 trunkline that we're engaged in examining.

2 A Yes.

3 Q And as I understand it  
4 I look at it as a more or less three stage process.  
5 We have the delta first, beyond that we have the  
6 artificial islands, and beyond that the deep water  
7 drilling. Those are three distinct types of expansion  
8 of the basin's resources. Is that correct?

9 A It can be looked at that  
10 way, yes.

11 Q And I understood your  
12 evidence in chief at the beginning of this segment of  
13 the Inquiry to say that the delta portion of that has  
14 really reached maturity. Is that a fair statement?

15 A The exploration program  
16 has reached maturity, yes.

17 Q The exploration program,  
18 using artificial islands, is somewhat less mature, but  
19 getting there.

20 A There are fewer of them  
21 of the total population, I guess, yes.

22 Q And obviously the deep  
23 water drilling has not yet begun.

24 A Right.

25 Q Just so we'll have it,  
26 can you give us a rough maximum depth that one could  
27 use artificial islands in?

28 A It's mainly a question of  
29 economics, Mr. Goudge. You can build them <sup>to</sup> any height,  
30 or any depth. It becomes an economic breakover, and we



Czaja, Horsfield, Motyka  
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1 expect that that will be somewhere in a 50 to 60-foot  
2 water depth.

3 Q And what's that in terms  
4 of miles offshore of the delta?

5 A Well, of course that  
6 varies considerably because it's quite shallow for quite  
7 a ways offshore, off the Tuk Peninsula side, for example,  
8 and yet it gets quite deep close to shore near -- over  
9 towards Herschel Island. So I can't give you any speci-  
10 fic distance.

11 Q Can you give me any kind  
12 of ball park figure on that? Are we talking 30 miles  
13 offshore at any point? What's the maximum?

WITNESS CZAJA:

14 A It seems that in an area  
15 like this where we are drilling there are many maps  
16 that provide for the precise data and we would be happy  
17 to arrange to find one for you, Mr. Goudge. There are  
18 maps that very clearly identify the --

19 Q I'm sure there are. It  
20 can't be a matter of dispute. None of you have it at  
21 your fingertips, I take it?

22 A No sir.

23 Q Moving to the first level  
24 of development as I put it to you, Mr. Horsfield, the  
25 delta area, or perhaps combining both the delta and  
26 the artificial island area, can you tell me where  
27 Imperial's next gas field for development will be?

28 WITNESS HORSFIELD: I wish  
29 we knew. I can't identify it for you, Mr. Goudge,  
30 until we discover it.



Czaja, Hornfield, May 1978  
Cross-Exam by Goudge

Q We have -- obviously we have -- well, perhaps I can put it this way. Is there any time frame within which that decision is likely to be made?

A We can't schedule discoveries.

Q Is it likely to be in the offshore island segment of the basin, as opposed to the delta?

A Well, speaking for Imperial we're drilling both offshore and onshore, and I don't know where it will be. Others are drilling elsewhere.

Q I take it, though, that having applied for a permit to take riprap from Campbell Island, as of 1978, to build a permanent island, there is some substantial hope at least that you will be in the business of developing a gas field from an artificial island by that time.

A By 1978, well it would be nice if we were; but that application we made at Campbell Lake, as was discussed earlier, is sort of a contingency application. It's to obtain rights to riprap just in case we need it. We have no immediate intention of taking it.

Q It's the mere image of a doom's day scenario, I take it, whatever you call that. What about Shell, Mr. Czaja, can you tell me now what the next gas field after Nig will be that Shell develops?





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WITNESS CZAJA: Sorry, I

can't.

Q And Mr. Motyka?

WITNESS MOTYKA: We're scratch-  
ing like heck around Parsons, and that's keeping us  
busy.

Q Can you tell me, can  
any of you gentlemen tell me whether when the next  
gas field comes in, new gas plants will be needed?

WITNESS HORSFIELD: WE don't  
know that. I guess we presently have that problem  
with Taglu, not knowing what size to build it yet,  
and we're holding our decision to the last moment just  
in case. I suspect Taglu will have some facilities  
to bring gas into --

Q Sorry, I can't --

A We'll have some extra  
facilities built into it to bring gas into it.

Q Some excess facilities  
to take account of the next reservoir.

A Right.

Q And is that true of the  
other two companies and their gas plants? Mr. Motyka?

WITNESS MOTYKA: I believe  
it's safe to answer in the positive. I sort of lost  
track of the response here. Your question is how long  
will it take after a new discovery to get it on-stream?

Q No, what I'm interested  
in knowing whether the next reservoir that Gulf devel-  
opes will require another gas plant.



Czaja, Horsfield, Motyka  
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1                   A     I can't answer that  
2  
3     one. As I mentioned, it depends on how you define a  
4                                 where  
5     reservoir. In the Parsons region, I just mentioned  
6  
7     we're working very hard at delineating, there  
8     are a number of reservoirs that are -- that might or  
9     might not be connected one with the other. So the  
10    strict interpretation of your question, the answer  
11    would be "No." The reservoirs we're looking for are  
12    in the Parsons region and would be tied into the Parsons  
13    plant.

14                   Q     Yes. Let me put it  
15  
16    another way so that I can see if I understand you.  
17  
18    Will there be any excess capacity built into the Par-  
19    sons Lake gas plant?

20                   A     A few other people  
21    asked me the same question. The decision as to the  
22    order of magnitude of the plant capacity will be a  
23    decision that we will make sometime in August or  
24    September, or thereabouts of this year. We have not  
25    definitely established any particular plant size. We  
26    have ball park type numbers, and following our winter  
27    drilling program we will sit back and assess what it  
28    is that we've acquired from a knowledge point of view  
29    and at that time strike a volume which will become our  
30    plant size. Whether or not it will have any plant  
31    capacity, excess plant capacity, I honestly at this  
32    time really don't know. We have a number of people  
33    who would like us to build to the proven number only,  
34    and I assure you there are others who would like to  
35    build to plant capacity for the probable number; and



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1 they are a little bit apart. I suspect it will be  
2 somewhere in between, but I don't know what that  
3 number is.

4 Q Mr. Czaja?

5 WITNESS CZAJA: Mr. Goudge,  
6 we're not planning to have plant capacity, significant  
7 excess capacity, that's in the context, in anticipation  
8 of future discoveries, no, we're not doing that.

9 Q So that Shell's position  
10 would be that<sup>if</sup> you make a significant future discovery  
11 an additional gas plant facility will be required?

12 A Not necessarily. I'd  
13 almost have to ask, "Where will you place that new  
14 discovery?" And when? If it's late, late in the  
15 life of the<sup>Nig</sup> plant, maybe it will just tie right into  
16 Nig if it's close by. I really can't answer that  
17 question because of the uncertainty of where and when  
18 the gas might be found.

19 Q Well, particularly when,  
20 presuming Nig is still taking up the entire capacity of  
21 your plant there, an y additional processing obviously  
22 would require new capacity.

23 A Normally in that case  
24 if it could be connected to Nig, we would possibly be  
25 dealing with an expansion rather than so much a new  
26 plant.

27 Q Whether it's an expansion  
28 or a new plant, it's an additional processing capa-  
29 bility.

30 A Yes sir.



Czaja, Horsfield, Motyka  
Cross-Exam by Goudge

1 Q Now let me move away  
2 from the Beaufort Basin to the area west of the delta,  
3 Mr. Horsfield, that you touched on with Mr. Bayly.  
4 If you take it in terms of potential for gas production,  
5 how far west would you say that potential extends along  
6 the Yukon Coastal Plain?

7 WITNESS HORSFIELD: The Alaskan  
8 border, as far as we're concerned.

9 Q Yes, and are you able to  
10 in a broad sense quantify that potential in terms of  
11 low, fair or good?

12 A It's a very difficult  
13 thing to do. There is one thing about a basin, an  
14 unexplored basin, and that is that the hydrocarbons  
15 will generally be found in one clearly concentrated part  
16 of it, and the trick is of course to try and find that  
17 part. That's what we're looking for. So all that is  
18 just to say that I really can't answer your question  
19 with any degree of certainty; but if you want my  
20 sort of my appreciation of it at this time --

21 Q Your best guess.

22 A -- we see, I guess, the  
23 Yukon onshore part. Let me say first of all that  
24 Imperial holds the permits on the onshore part of the  
25 Yukon, and out to 60 feet of water in the delta area.  
26 So I'm most familiar with that area, and from our  
27 seismic and from our drilling I would say that the  
28 Yukon onshore, if there is anything at all there,  
29 it's probably gas. In the offshore there are several  
30 structures that we can see in our seismic that could be





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oil or gas, and the structures there are more concentrated than they are to the east.

Q Just pausing there, what is the consequence or volume of your saying that they're more concentrated?

A Well we can see that the structures are more concentrated there, and I guess if you want to put a probability on it, there is a good chance of oil or gas in that area.

Q But to me as a layman, does "more concentrated" mean more likely to find it?

A No. Structures can be quite concentrated in an area be completely filled with water. I guess if you look at the number of structures and the possibility of finding something you might say that the more structures, the better chance you have. But that does not mean that there will be more there. That's the point I'm trying to get across. There is an awful lot of uncertainty involved and you've asked for my appreciation and I'm trying to give it to you.

Q I understand, sir. So what you've told us is that insofar as your seismic work tells you anything, what may be on the shore appears to be gas, what may be offshore might be either oil or gas.

A Yes.

Q And would you be prepared --

THE COMMISSIONER: I wonder if



Czaja, Horsfield, Motyka  
Cross-Exam by Goudge

1 we could adjourn in a moment, it's almost five, I  
2 think.

3 MR. GOUDGE: Yes.

4 THE COMMISSIONER: If it  
5 isn't inconvenient for this panel, can you get a plane  
6 at noon tomorrow? When is the next --

7 MR. BALLEM: 10:35 in the  
8 morning. If it's at all possible I would really  
9 appreciate if we could finish this. If not, of course,  
10 then we'll lay over to tomorrow.

11 MR. GOUDGE: I won't be very  
12 much longer, sir. It's 25 to five.

13 THE COMMISSIONER: Yes. All  
14 right, well we'll carry on then.

15 Q I wonder, Mr. Horsfield,  
16 if you would come over to this map for a minute and  
17 just explain something to me, if you don't mind?  
18 In your evidence, these are the slides that you have  
19 introduced and it shows where the discoveries have  
20 been made in the delta and the Tuk Peninsula. The two  
21 wells that Dome wants to drill, would they essentially  
22 lie north of the East Mackenzie Bay?

23 A As I understand it,  
24 sir, they are north of Kugmallit Bay.

25 Q And how far north of  
26 Tuk do they extend?

27 A I don't know the miles,  
28 but they are somewhat up in this area.

29 Q And the two islands that  
30 you propose to build this summer are in Kugmallit Bay



Czaja, Horsfield, Motyka  
Cross-Exam by Goudge

1 too, are they?

2 A Yes, they are north of  
3 Hendrickson Island and north of the (inaudible)  
4 Peninsula here and here.

5 THE COMMISSIONER: Fine.

6 MR. GOUDGE: Q Mr. Horsfield,  
7 you've told me about the number of structures or the  
8 frequency of structures offshore the Yukon. Would you  
9 be prepared to put a low, moderate or good potential  
10 designation on that area?

11 A Let me correct a mis-  
12 impression I may have given you when we were talking  
13 about onshore Yukon and offshore. I did mention that  
14 our acreage goes out to about 60 feet of water, which  
15 is not very far offshore on the Yukonside, and the  
16 concentration of structures I was talking about is  
17 mainly north of Shallow Bay, a little north and west  
18 of Shallow Bay. I didn't want to leave you with the  
19 impression I was talking about everything north of  
20 the Yukon over to the Akaska border.

21 Q How far west of  
22 Shallow Bay?

23 A To the 60-foot contour  
24 it's -- I believe it comes in fairly close to land  
25 just north of Tent Island but I'm not too sure. I'd  
26 have to look on the map.

27 Q I come back to my ques-  
28 tion about your/willingness to put a designation on  
29 it as low, fair or good potential?

30 A I can't say about any





Czaja, Horsfield, Motyka  
Cross-Exam by Goudge

1 particular area, Mr. Goudge.

2 Q I see.

3 WITNESS MOTYKA: Mr. Goudge,  
4 are you familiar with a game called "Gusher"?

5 Q No.

6 A It gets down to reality  
7 lifewise, it's an animals game and although I wouldn't  
8 suggest for one minute that geophysical, geological  
9 interpretation is that simple, you stick a hole  
10 through a cardboard and if there's a block in it you've  
11 found yourself a well. It isn't that simple in real  
12 life, but it gives you a random distribution and I  
13 think that's what Mr. Horsfield was trying to tell you,  
14 that there are structures, there's a random distribu-  
15 tion in Mother Nature, and if we're fortunate to stick  
16 the pin in the right place the first time we giggle;  
17 if we don't we cry a little while and go somewhere else,  
18 until we finally find it or else give up.

19 Q Are there any general  
20 rules of thumb, though, Mr. Motyka, such as this --  
21 let me put one to you and see if it makes any sense --  
22 when you're dealing with a basin like the Beaufort  
23 Basin, your chances get better as you go slightly  
24 offshore.

25 A It depends on the  
26 particular delta basin you're talking about.

27 Q Well, let me talk about  
28 the Beaufort Basin in particular.

29 A We don't know, we truly  
30 don't know. Our expectations are that that in fact is



Czaja, Horsfield, Motyka  
Cross-Exam by Goudge

1 what will happen. However --

4 Q Pausing there, why do you  
3 say that?

4 A In that the kind of --

5 Q Why do you expect that?

6 A -- are physically larger  
7 and therefore the potential is greater than if they  
8 are in fact hydrocarbon filled to the spill point, the  
9 reserves will be larger.

10 Q Yes.

11 A There are delta deposits  
12 in the world where as you go out the reverse is true.  
13 We only with time will determine which in fact is the  
14 situation for the Beaufort Delta complex.

15 Q There's no doubt that  
16 the seismic work in the Beaufort Basin would indicate  
17 to you that as you move into what I've described as the  
18 drill ship area, as opposed to the artificial island  
19 area, you move into potentially big finds.

20 A The structures are  
21 larger, that's correct.

22 Q And somebody once told  
23 me, and you might tell me if I am correct in my  
24 understanding, that that's what happened in the  
25 Mississippi delta. The same structure sequence from  
26 shore offshore was seen there, as is seen in the  
27 Beaufort Basin.

28 A And as a result what  
29 would you suggest happened?

30 Q Well, do you agree with



Czaja, Horsfield, Motyka  
Cross-Exam by Goudge

1 me that that was the case?

2 A Generally speaking that's  
3 correct.

4 Q Yes, and that's consistent  
5 with what you've just gave as your opinion, that there --  
6 that the large finds, if there are large finds, are  
7 going to be found further offshore.

8 A That's correct.

9 Q One other short area  
10 I'd like to deal with, Mr. Horsfield, with you is some  
11 slight elaboration of the technology that exists or  
12 may exist at present to get offshore gas onshore. You  
13 said, I think, in answer to Mr. Bayly, that it might be  
14 possible to put a gas plant on an artificial island.  
15 Is that correct?

16 WITNESS HORSFIELD:

17 A That's conceivable, yes.

18 Q Has it been done elsewhere  
19 in the world?

20 A Well, I can't see that  
21 there's any difficulty in putting a gas plant on an  
22 island any more than a difficulty on land.

23 Q I take it it would also  
24 be possible to have a flow line come directly from an  
25 offshore well to a gas plant onshore, in the circum-  
26 stances of the Beaufort Basin?

27 A It's possible, yes.

28 Q Though in that context  
29 there are certain difficulties such as storm surges and  
30 ice scour. You agree that those would be problems for  
31 a simple flow line onshore.



Czaja, Horsfield, Motyka  
Cross-Exam by Goudge

1 A Well, whether it's a  
2 simple flow line or/<sup>a</sup>pipeline, yes, those are problems.

3 Q And I take it there are  
4 no precedents anywhere in the world for flow lines  
5 from wells offshore that must get around those problems.  
6 Ice scour problems.

7 A I don't know about ice  
8 scour, but there are flow lines under channels where  
9 there have been things like dragging anchor problems  
10 and so on.

11 Q Yes, not ice scour, and  
12 presumably not as well permafrost that may exist on the  
13 ocean bed.

14 A No, I'm not familiar  
15 with any of those. There may be some.

16 Q Yes.

17 A I don't see those as  
18 insurmountable problems, either.

19 Q No, but those are problems  
20 of that are on the frontier/technology in your industry.

21 A Not so much on the  
22 frontier of technology. They need to be taken into  
23 account, that's all.

24 Q They need to be planned  
25 for and they've not been planned for and not had to be  
26 planned for elsewhere in the world.

27 A That's correct, but what  
28 I mean, Mr. Goudge, if there is an ice scour to 30  
29 feet, then you can bury pipelines that deep. That  
30 doesn't require new technology.





Czaja, Horsfield, Motyka  
Cross-Exam by Goudge

1 MR. GOUDGE: Now that, sir,  
2 completes the questions I had. I had a few questions  
3 that the Town of Inuvik asked me to put, and they were  
4 passed on by Mr. Sider's panel.

5 Q The first question is:  
6 What plans does Gulf have for the utilization of the  
7 Inuvik M.O.T. airstrip for large aircraft landing,  
8 and the transfer of materials and personnel for the  
9 Parsons Lake site by small aircraft, or by road? Can  
10 you speak to that, Mr. Motyka?

11 WITNESS MOTYKA: Yes, I can.  
12 The reason for the question, I'd like to first of  
13 all explain from my interpretation, did I all of a  
14 sudden come alive or am I too close? That question  
15 arises due to a sentence that we put into our  
16 application last October to Indian & Northern Affairs  
17 with respect to our approval in principle, and at that  
18 time we wished to raise the concern that the Inuvik  
19 facilities required a very serious examination prior  
20 to the producers moving into the vicinity, and that  
21 has been accomplished. The M.O.T. and a number of other  
22 people are very much aware of our concern at the  
23 present time and share our concern. There are ongoing  
24 activities between/<sup>the</sup>various participants, including  
25 government agencies, to examine whether or not the  
26 Inuvik airstrip should be upgraded, and if so, how,  
27 or whether in fact it is in the best interests of  
28 all concerned to install a separate facility. Those are  
29 ongoing studies that have been referred to previously.

30 The thing I'd like to point



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1 out is that in the examination of this question the  
2 entire areas to the impact on Inuvik, joint construction  
3 by the construction personnel, the amount of time that  
4 is taken, the amount of time and energy that is con-  
5 sumed by the transferring of facilities from a large  
6 airplane at the Inuvik Airport to move it to a smaller  
7 strip by smaller airplanes is costly, and the impact  
8 might ultimately be such that we decide collectively  
9 that the airstrip in Inuvik will or will not be expanded.  
10 It will be, I believe, a joint government-industry  
11 decision with ultimate direction being given by the  
12 government agencies as to how and where these facilities  
13 will be made available.

14 Q You have no plans at  
15 present, though, for a permanent jet strip at Parsons  
16 Lake?

17 A No sir, but we sure are  
18 concerned that the adequate facilities are made  
19 available in the delta region.

20 Q Lastly, Mr. Motyka, does  
21 Gulf plan to provide heating gas and liquid products  
22 for use at Inuvik and other delta communities?

23 WITNESS MOTYKA: If we have  
24 them available I believe that we have already discussed  
25 that through our technical panel that we are examining  
26 the feasibility of generating useful liquid products  
27 and we certainly, if we do that, will wish to make  
28 them available to the market, if it exists.

29 MR. GOUDGE: Thank you, sir.  
30 Those are the questions that the panel asked that I



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quote.

THE COMMISSIONER: Mr. Horsfield, the tendency of your exploration activity, and that of the other companies, into the Beaufort Sea seems to be on a line or at least generally in a northerly direction from Richards Island, and Kugmallit Bay. You pointed out to me just now that two of your islands, you're building two islands this summer in Kugmallit Bay, and that Domes' deepwater drilling program presently under consideration by the Department is north of Kugmallit Bay.

You were good enough, in your overview, which I must say I thought was very, very helpful, to say that,

"It now appears that most of the remaining potential of the Mackenzie Basin lies under the Beaufort Sea. The onshore portion of the exploration play has matured, with most of the seismic work having been done and most of the significant drilling prospects having been drilled. While some onshore exploration activity will continue for a number of years, it is likely that the major exploration effort will shift towards offshore. Imperial and Sun have already drilled a total of ten wells from artificial islands in the sea. Imperial plans to construct three more islands this year and Kenmar has announced plans to drill two holes in deeper water, using floating drill ships.





Czaja, Horsfield, Motyka  
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1 Considering the very high drilling costs in  
2 the Beaufort Sea, it is unlikely that more  
3 than five exploratory holes will be drilled  
4 offshore during each of the next few years."

5 Now, one of the ways in which I suppose we can gauge  
6 the judgment that the industry has formed regarding  
7 the tendency of discovery, is to see where they spend  
8 their money, and you've indicated here that it will  
9 be spent offshore. Large sums have been spent on  
10 these ten islands that have been built in the sea.  
11 You're building three more this year, and two of them,  
12 you say, are in Kugmallit Bay, and Dome wants to build  
13 these two -- not build them but drill these two holes  
14 in deep water north of Kugmallit Bay. You can't  
15 afford to do very much drilling in the Beaufort Sea  
16 because of the expense, that's what you say here, and  
17 now are you in this position that you're moving offshore  
18 and you're moving in the direction of these islands and  
19 the two wells that Dome wants to drill in deep water  
20 would suggest that's where you're spending your money,  
21 that's where if you look at a map you appear to be  
22 headed. Is that what we should regard as indicating  
23 the judgment of the industry regarding future discover-  
24 ies in the sea?

25 A I think, Mr. Berger,  
26 you should take it as an indication of these parti-  
27 cular companies that are doing the work, not of the  
28 industry. So let me focus in on that. There are  
29 two factors that dictate, two main factors that dictate  
30 where we operate.



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(1) is our geological appreciation that we have gathered to date, and we tend to focus in on certain plays or certain areas which can change abruptly, incidentally;

(2) the other thing is the straight matter of logistics of cost , and availability, and for example we could not build a large volume of islands we're talking about out of gravel, we needed to do it with a big sand dredge, which is the way we're going to do it north of Tuk. So we had to get a dredge and that dictated when we built that island and so the logistics have about as much influence on our program as the geological strategy, if you like.

Now both of those can change abruptly and I don't believe you should read too much into the fact that we're building islands in certain places, or proposing to drill the next round of wells in certain places, and just as an example of that, we are drilling now in the -- towards, on the Shallow Bay side of the Immerk Peninsula in two places, an island called Igitarjuaq and one at Netzurt North; and we had proposed, as I mentioned earlier, to build another island north of Netzurt North called Issigak , and we applied for the island. We do not now intend to build it. We intend to move into another area which as a result of our geological appreciation, we would prefer to move that way, and also we now have the dredge availability over there. So it's a complicated thing and I don't think you should read too much into the short-term program.



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I don't know if I've answered your question to your satisfaction.

THE COMMISSIONER: No, I wanted you to comment on what I had said so that I didn't read too much into it, into the tendency that appears in the expenditures made so far.

A I might add one other thing. There is a tendency in our industry to build on success, so a discovery will redirect effort.

Q And that's why it seems to have moved out from <sup>the</sup> initial discoveries the east side of the delta.

A Yes, that attracts the attention of geologists as well as every public and everyone.

THE COMMISSIONER: Right. Well, I think we should adjourn then and I just want to thank you gentlemen for being good enough to come and answering Mr. Bayly's questions and Mr. Goudge's and mine. I certainly appreciate it. Let me thank you especially, Mr. Horsfield, for your presentation last week which I think set the scene very well for all of us.

MR. GOUDGE: Before we adjourn for the day I would really like to express my appreciation and Mr. Scott's appreciation to Mr. Ballem, and through him to his clients, for the degree of co-operation we have had in their coming and presenting such a full set of panels to you. It made the job which you assigned to Mr. Scott in your



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rulings dischargeable very easily.

THE COMMISSIONER: Well, thank  
you.

MR. BALLEM: Thank you, Sir.  
I'd just like to say that it has certainly been a  
real pleasure for us to be here. We feel that we have  
all benefitted very much from the dialogue and the  
discussion that has taken place for the past two weeks,  
and I would further add, of course, we will file all  
the additional evidence. We'll comb through our notes  
and the transcript, when available, and we will file  
that. We have through Professor Jackson made arrange-  
ments to provide the necessary people at the community  
hearings that will be held, and I am instructed further  
to say that if at any time we can be of any additional  
assistance to you, Mr. Goudge has my phone number.  
Thank you very much.

THE COMMISSIONER: Thank you  
very much, Mr. Ballem.

(WITNESSES ASIDE)

THE COMMISSIONER : Well, we'll  
adjourn till 9:30 tomorrow and hear your evidence then,  
Mr. Bayly.

(PROCEEDINGS ADJOURNED TO JANUARY 28, 1976)



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M835  
vol.118

27 Jan., '76.

Mackenzie Valley Pipeline  
Inquiry

~~author~~ W. Treaty

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M835  
vol.118





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Mr. Stephen T. Goudge,  
Mr. Alick Ryder and  
Mr. Ian Roland for Mackenzie Valley Pipeline  
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Mr. Pierre Genest, Q.C.,  
Mr. Jack Marshall, and  
Mr. Darryl Carter for Canadian Arctic Gas  
Pipeline Limited;  
Mr. Reginald Gibbs, Q.C.,  
Mr. Alan Hollingworth &  
Mr. John W. Lutes, for Foothills Pipe Lines Ltd.;

Mr. Russell Anthony &  
Pro. Alastair Lucas for Canadian Arctic Resources  
Mr. Garth Evans Committee;

Mr. Glen W. Bell and  
Mr. Gerry Sutton, for Northwest Territories  
Indian Brotherhood, and  
Metis Association of the  
Northwest Territories;

Mr. John Bayly  
or  
Miss Leslie Lane for Inuit Tapirisat of Canada,  
and The Committee for  
Original Peoples Entitle-  
ment;

Mr. Ron Veale and  
Mr. Allen Lueck for The Council for the Yukon  
Indians;

Mr. Carson H. Templeton, for Environment Protection  
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ities;

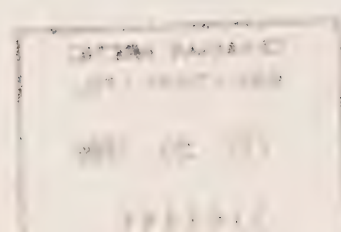
Mr. Murray Sigler for Northwest Territories  
Chamber of Commerce.

Mr. John Ballem, Q.C., for Producer Companys;

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WITNESSES FOR C.

James M. SHEARER

In Chief

Cross-Examination by Mr. Goudge

D.R. SHAW

In Chief

Cross-Examination by Mr. Goudge

Douglas PIMLOTT

Chief

# EXHIBITS:

438 Letter from Horsfield to K.P. Sam,  
December 20, 1974

439 Qualifications & Evidence of J.M.  
Shearer

440 Qualifications & Evidence of D.R.  
Shaw

441 Qualifications & Evidence of D.  
Pimlott





J. M. Shearer  
In Chief

INUVIK, N.W.T.

JANUARY 28, 1976

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

MR. BAYLY: Mr. Commissioner,  
I'll be presenting the evidence of Mr. Shaw this morning, or Mr. Shearer this morning and he has been sworn, I've seen, and perhaps we could begin.

THE COMMISSIONER: Fine.

JAMES M. SHEARER, sworn:

DIRECT EXAMINATION BY MR. BAYLY:

Q Mr. Shearer, before beginning I wonder if you could inform the Commission of your background and your qualifications?

A I went to University in Carleton in Ottawa and did some graduate school work at Memorial in St. Johns and Dalhousie in Halifax, mainly in the marine geological field.

Q And the curriculum vitae which is attached to your evidence reflects your academic and work background?

A Yes.

Q And I wonder if you could read your evidence before this Commission?

A OK.

THE COMMISSIONER: Do you mind if I look through this curriculum vitae before you begin?

A Sure.

THE COMMISSIONER: Carry on with it, sir.

A OK. This is going to be



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J. M. Shearer  
In Chief

1 a discussion on the possible scenario for future  
2 petroleum development in the Mackenzie Delta area.  
3 Now, that the petroleum development has begun in the  
4 delta with some exploration and some plans for production,  
5 it's not just an exercise anymore in trying to predict  
6 what might happen in the future, because in fact,  
7 something will happen so it's worthwhile trying to  
8 predict and maybe plan ahead.

9 I'm going to try and do this  
10 in two stages by beginning with what's happened to date  
11 and the various activities for production based on  
12 exploration to date and then I will try and extend this  
13 into the future with some reasonable estimates.

14 I was wondering if we could  
15 have figure 1 now and maybe three-quarters of these  
16 lights off. We'll leave the ones on the far side  
17 on and the three-quarters over here. That's great.  
18 Now if we could have figure 1. The first figure is  
19 a slide with the shaded areas showing the -- is this  
20 working? Yes. With the shaded areas showing the  
21 areas of possible petroleum potential, including the  
22 areas of paleozoic rocks where the potential are somewhat  
23 less and Mesozoic tertiary basins where the potential  
24 is usually quite a bit higher. If we could have  
25 the next slide please.

26 This shows the leasing arrange-  
27 ment in the Mackenzie Delta to date. With the leases  
28 going far off-shore roughly to the edge of the  
29 continental shelf where the water depth go from  
30 80 meters to 400 meters very, very quickly. As you can



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In Chief

1 see, pretty well the whole area right over to the  
2 Richardson Mountains on the west has been leased out.  
3 Do we have the third figure now, please?

4 This is the figure of the  
5 Mackenzie Delta. I'm going to have to go without  
6 the mike for a while here. The scale on this is  
7 sixty nautical miles from this distance here up to here  
8 so it's roughly 200 miles by 200 miles on the full  
9 scale of the map. The dark red lines here are roughly  
10 the edge of the tertiary Mesozoic Basin where potential  
11 is thought to be very high and the other edge of the  
12 basin coincides again with the continental shelf where  
13 it's thought that the thickness of tertiary sediment  
14 goes on further north but the water depth  
15 is so deep that it is taken as the practical edge of  
16 the tertiary basin at this point. There is the town  
17 of Inuvik, Aklavik, Tuktoyaktuk, Herschel Island and  
18 Garry Island, Pelly Island and Holman Island.

19 Ok, if we could have the next  
20 slide, please. We're going to go through a set of  
21 slides here that take us from just the physical --  
22 the map of the Mackenzie Delta area into the drilling  
23 record to date. The various results from that drilling  
24 record into proposed plans for facilities to process  
25 what's been found, take it south and then some estimates  
26 as to what might happen in the future.

27 Now this is the drilling record  
28 to date. The star shaped holes are dry holes.  
29 Green is a gas well, red is an oil well and <sup>the</sup> various  
30 green patches are the oil fields.



J. M. Shearer  
In Chief

THE COMMISSIONER: Excuse me,  
do you mind starting over again with that description  
of what these marks mean?

A Sure. These particular  
star-shaped symbols are those of a dry hole where a  
well has been drilled and no hydrocarbons have been  
encountered. A gree star-shaped symbol is where they've  
encountered gas. A red and a green symbol together  
is where they've encountered gas and oil together, and  
the patches of green here are the discovered to date  
gas fields. I've taken the liberty of putting on a  
field at Adgo because they've got a delineation well  
there which has had some hydrocarbons in it so I feel  
it's a delineated field and it will be brought in --  
tie into the proposed system which we'll go into  
in the next figure brought in very soon.

This particular drilling record  
seen here I might say what's gone on to date are  
not permanent features. These drill hole locations are  
not there any more and there may be very little evidence  
that a camp had ever been set up there. Various seismic  
lines run across the delta a number of which cannot  
be seen anymore and some/certainly have done a lot of  
permanent damage. Various winter roads have been used  
to set up these camps which can't be seen anymore.  
But the activity, based on the discovery of gas fields  
results in a certain amount of permanent facilities  
which are going to be constructed.

OK, if we could have the  
next slide, please. This is the -- the permanent





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facilities that are being proposed to date, based on the discoveries of Parsons Pond, Taglu and Niglintgak. This is one we feel is going to be brought Aqo is going to be brought in very soon. The Canadian Arctic Gas cross-delta route comes down like this, across over here, coincides with Foothills over here and runs across in this direction.

Another application of Canadian Arctic Gas went down the west side of the delta to Travaillant Lake and the delta lateral coincided with Foothills down to just sort of north-east of Inuvik and would have continued on down this way.

This in fact shows the two alternatives of Canadian Arctic Gas and therefore, shows a number of pipelines that one of these alternatives will be chosen. Gas plants are proposed at Parsons Lake, Taglu and at this point, Niglintgak. Previous plans had been to run Niglintgak gas over by <sup>a</sup>feeder line, the particular green/we have here because this is a feeder flow line and now this would become a blue line here as part of the trunk gas pipeline system.

At this point, I would like to say that a lot of drilling has gone on land and that inherent in the application or inherent in the industry's presence in the delta is the geological potential of the offshore. This has been stated by Horsfield in his overview for the delta producers and Vern Horte in a policy statement in phase one and the geology certainly doesn't stop at the shoreline,



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1 it runs offshore and in fact a lot of people feel  
2 the offshore has a greater potential than the on-  
3 shore so that the offshore and onshore tied in  
4 geologically, tied in in terms of petroleum production  
5 and I'd just like to say that there's a definite  
6 difference between the logistics of working offshore  
7 and offshore even though the geology runs offshore.

8  
9 Now, could we have the next  
10 figure, please? This figure shows a map of possible  
11 drill hole locations both onshore and offshore, in  
12 sufficient spacing to locate the major producing  
13 fields. When I say "major producing fields," I'm assum-  
14 ing that the geology offshore is going to produce in  
15 somewhat proportional to how the onshore has produced  
16 so that there would be a number of fields found off-  
17 shore. We don't know the exact location, but there  
18 are many structures out there upon which drilling will  
19 be done. A large fault, the Kaltag fault, runs through  
20 from about King Point in a north-east direction and  
21 I've put some of the petroleum discoveries along that  
22 fault, although there's large diapirs which are salt  
23 or shale plugs that have come up from below that may  
24 have formed traps where petroleum could exist.

25 I've shown both gas and oil  
26 discoveries offshore. The round red dots are oil  
27 discoveries and the green star-shaped symbols are gas.  
28 I'm assuming that some gas and oil would be discovered  
29 together offshore. There may be a predominance of one  
30 over the other but I feel, as on land, there will be  
some oil, although some people say there may be a lot



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1 more oil. I'm just going to get a drink of water,  
2 if you don't mind.

3 MR. BAYLY: While Mr. Shearer  
4 is getting a drink of water, the maps on the wall  
5 on your right, sir, are showing what is shown on the  
6 slides, so if you're having the<sup>same</sup> difficulty that I am  
7 with the red and green star-shapes, they can be examined  
8 at closer range.

9 THE COMMISSIONER: Right.  
10 Right. Take your time Dr. Shearer.

11 MR. SHEARER: Yes, sir. The  
12 fields shown in this particular map represent, I feel,  
13 some twenty to thirty trillion cubic feet of gas and  
14 two to three billion barrels of oil. In other words,  
15 the frequency of fields existing offshore as shown  
16 would probably have proven reserves in that range. This  
17 is somewhat less, these particular reserves or fields  
18 shown are in frequency somewhat less than would have  
19 to be discovered to prove out the roughly 40 trillion  
20 cubic feet as one estimate by industry and some five  
21 to eight billion barrels of oil so that the frequency -  
22 the number of fields shown offshore may in fact be  
23 even larger than that.

24 The number of drill holes needed  
25 to explore a given area is primarily dependent upon  
26 the size of the geological structures. In this respect,  
27 the structures encountered so far in<sup>the</sup> Mackenzie Delta  
28 have been relatively small, compared with Prudhoe Bay,  
29 for example. In fact, the drilling to date has been  
30 high enough and close<sup>enough</sup> spacing to virtually eliminate the





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1 possibility of a Prudhoe Bay size structure in the  
2 onshore area. Prudhoe Bay is roughly 20 miles by 20  
3 miles which would be something of this size which is  
4 somewhat difficult to slip in. The southwestern  
5 delta is, in fact, one area where it is possible to  
6 put something that size and we'll get into that in  
7 a minute.

8                   There's some debate as to the  
9 nature of size of structures existing in the offshore  
10 areas. In some cases seismic data seem to show less  
11 evidence of normal faulting and consequent splitting up  
12 of potential hydrocarbon bearing horizons into smaller  
13 segments. The number of exploratory wells to be drilled  
14 offshore is estimated by extrapolating from the number  
15 of about 100 or 110 in the onshore areas same 300 to 400  
16 exploratory holes have yet to be drilled. If some  
17 credibility is given to the fact that the structures  
18 are larger offshore, one might then say that two to  
19 three hundred exploratory holes remain to discover --  
20 this is remain beyond the ten meter line to be drilled  
21 to discover all the potential that is out there.

22                   This drilling taking place in  
23 the summer months from July to September when the polar  
24 pack has receded some 50 to 100 miles from the coast,  
25 the question of drilling relief wells and oil cleanup  
26 in the event of a blowout becomes a serious problem.  
27 This will be dealt with in more detail in later panels.  
28 Suffice it to say that nowhere else in the world is  
29 petroleum exploration carried out in such hostile en-  
30 vironments. Just a comment that those holes are not



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1 going to all be drilled at the same, within a year  
2 or two. This is a twenty-year -- a twenty-year plan  
3 and if they went offshore and drilled thirty dry holes,  
4 you can be sure they wouldn't drill anymore. With  
5 each given number of dry holes a number of discoveries  
6 must be made to provide incentive to continue. So  
7 that this is a scenario assuming that as you move into  
8 the offshore, you make a number of discoveries and  
9 this continues the incentive to move on and after a  
10 <sup>year</sup> 20/period, you will have covered the offshore area,  
11 with this kind of frequency of drilling. After  
12 drilling has been done, these hole -- there'll be no  
13 evidence of this having been done unless something goes  
14 wrong with one of them.

15 It's really the permanent  
16 facilities based on hydrocarbon discoveries offshore  
17 which we'll get into in a minute. Could I have  
18 the next figure, please?

19 This is a -- Figure 7 is a  
20 composite of all permanent facilities that will have  
21 to exist if oil and gas in the offshore is to be  
22 transported south. We <sup>have</sup> seen in figure 5 gas plants at  
23 Parson's, Taglu and Niglintgak which at this point  
24 are proposed to handle roughly 1.25 to 1.75 billion  
25 cubic feet per day of gas. At this point I'd like to  
26 say that the lateral -- the trunk and lateral lines  
27 being constructed by Foothills and Canadian Arctic  
28 Gas are being -- are proposed to take some 3 to 4 billion  
29 cubic feet per day. The implication would be that they  
30 expect in the future to find roughly -- they expect to



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1 find and transport two to three times more than they've  
2 proposed from say Parson's, Taglu and Niglintgak at  
3 this time.

4 Vern Horte in his policy panel  
5 in phase one has even talked of looping if enough gas  
6 and oil are found. Enough gas, in this case.

7 This figure, figure 7 shows  
8 a scenario presenting a trunk gas pipeline, a possible  
9 loop line beginning at the Parson's Pond area, a trunk  
10 oil line with a number of tie-in oil lines. The red  
11 dashed line is an oil trunk line running south. A tank  
12 farm at Tagula, a tank farm over here at King Point,  
13 the facilities -- the gas plant -- this blue dash or  
14 green dash -- I'm color blind so I find it hard to  
15 make the colors out here. The gas plant at King Point  
16 and a tank farm at King Point are based on discoveries  
17 on the west side of Mackenzie Bay. It's a matter of  
18 economics whether if you have a discovery on the west  
19 side of Mackenzie Bay, whether you construct a feeder  
20 line to existing gas plants, say <sup>at</sup> Niglintgak or  
21 Taglu and if you have enough that you're going to have  
22 to increase the -- bring in a new module for the Taglu  
23 gas plant, you might as well construct a new gas plant  
24 here and tie it right into the existing gas line, if  
25 there is one over there, of course.

26 The yellowdashed lines are the  
27 offshore flow lines that have to hook up the discoveries  
28 in the offshore, run into the -- they're usually  
29 going to be constructed in the shortest possible route  
30 because offshore flow lines are going to be a very





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expensive proposition. Their expense is going to mainly exist because of the surface geological conditions in the offshore which are offshore permafrost to very close to the surface and moving ice which quite frequently scours into the bottom to depths of between 20 and 30 feet as a maximum. Therefore, to safely construct flowlines in the offshore, they're going to have -- this is within depths of 100 feet and possibly greater, water depths of 100 feet they will have to be buried to 30 feet below the surface so that they can't be scoured, run into by floating ice.

When you bury them in the bottom, you run the hazard of burying them into permafrost and this wouldn't be a problem if your pipeline -- your flowline was cool but in this case, discovered oil and gas offshore is going to be hot, it will not be able to be processed offshore unless it's 30 feet under the bottom and I feel that they will have to hook it up to the discovery wells, hook them to the pipeline. They'll have to hotwire the pipeline to keep hydrates from forming, to keep the oil from becoming viscous and when they do that the pipeline will be hot; if it runs into permafrost, it will perhaps cause degradation of the permafrost so that the hotwire on the inside of the pipeline will have to be insulated and have a refrigeration coil around it to keep the permafrost from melting. If it was possible to locate where the permafrost was offshore in detail, one might be able to avoid it and one should also look





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1 into how much ground ice is in the permafrost --  
2 whether there's a lot segregated and ground ice and  
3 in fact collapse would occur if it melted.

4           There will be a tendency to  
5 locate the future gas processing plants and all tank  
6 farms in areas where development has already taken  
7 place, if possible, such as Taqlu, Parson's Lake  
8 and Tuktoyaktuk. The -- Ok, I guess, I've already  
9 said that. Figure 7, then, is thought to be a  
10 reasonable scenario of possible future activities  
11 in the Mackenzie Delta. OK, if we could have figure  
12 8 then, please.

13           Figure 8 shows the distribution  
14 of oil and gas fields in the Williston Basin of Alberta  
15 which has been developed over the last thirty years into  
16 a mature basin. The oil and gas fields and inter-  
17 connecting pipelines form a complex system defined by  
18 geology and land leasing arrangements. It is not  
19 unreasonable to expect something of similar complex-  
20 ity in the Mackenzie Basin, although some cooperation  
21 is occurring among participant companies because of  
22 the high cost of exploration and development in frontier  
23 areas.

24           Recent evidence presented by  
25 Shell Canada indicates that they are now planning to  
26 construct their own gas plant at Niglintgak and  
27 production will come from 9 or 10 separate wells and  
28 not a production cluster. This development scenario dif-  
29 fers very little from initial developments in Alberta.  
30 Referring, if you can remember back to figure 7 for a



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1 minute, it is conceivable that the field recently de-  
2 lineated at -- I wonder if we could go back one  
3 figure, Pat? Sorry for the delay. Anyway when the  
4 figure comes on, we'll look at the possibilities  
5 where a number of small fields may be delineated in  
6 the onshore areas.

7 MR. BAYLY: An example of  
8 Murphy's law.

9 MR. COMMISSIONER: We'll relax  
10 for a moment or two.

11 WITNESS SHEARER: Beautiful.  
12 Plans to date have tied in Parson's Pond, Taglu and  
13 Niglintgak. I feel that Adgo is the field that is  
14 going to be brought into production. Kumak, down  
15 here has just recently had a delineation well which  
16 is with positive -- therefore I feel that is going to  
17 be tied into existing -- or the proposed plant struc-  
18 ture of Taglu, Niglintgak or Parsons. There is a  
19 whole area in the east channel of the Mackenzie where  
20 very little drilling has gone on to date. There's  
21 the one dry hole, another dry hole -- and there's a  
22 fair number of holes to be drilled in this area. The  
23 structures -- in fact the structures do not exist.  
24 It's an area where stratographic traps might be found  
25 with petroleum.

26 Anything found there will have  
27 to be tied in probably south of the East Channel,  
28 would tie into Parsons, north of the East Channel,  
29 tied into Taglu. The reason I am going into this is  
30 that we feel in the future a number of small fields



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1 may be found in these areas. Kumak, the southwest  
2 delta. Shell is doing a lot of work -- a lot of  
3 seismic work in here. In the future, they will  
4 probably do some drilling in there. I feel the  
5 structures are very small but they may discover  
6 something in there. It will have to be tied into  
7 the proposed system after the proposed system has been  
8 built and the analogy I am making here is with the  
9 following slide of Alberta where a large system is  
10 built and following discoveries must be tied in in the  
11 best possible manner to a -- the primary system which  
12 was built, based on other discoveries and not on the  
13 following discoveries, which is sort of obvious.

14 Offshore I have the flowlines  
15 shown in the most expedient manner, running from the  
16 offshore discoveries to the -- the furthest offshore  
17 to the middle ones, to the shore. If, in fact, the  
18 offshore areas produce hydrocarbons first, a flowline  
19 would be run to shore to bring that into the existing  
20 facilities, then five or ten years from now when they  
21 were drilling in other areas and a field was found  
22 closer to shore, it would have to be run into a --  
23 run into the existing flowline with a less efficient  
24 by virtue of the time of discovery, the flowline  
25 efficiency --<sup>or</sup> the amount of flowlines existing would  
26 be less efficient than if we knew where everything  
27 existed and we could plan appropriately.

28 Figure 9. This is just a  
29 picture of the Niger River Delta where they've done  
30 a fair amount of drilling. In fact a thousand holes to





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1 date. This is the shoreline, running along here.  
2 The Niger River coming down here and the ocean. They've  
3 done a fair amount of drilling offshore to water depths  
4 of, I would think, 200 feet. Every dot here is an  
5 oil field with roughly 85 to 90 oil fields discovered  
6 to date.

7 In actual size, the Mackenzie-  
8 Beaufort covers about half that of the Niger so that  
9 one might expect a proportional reduction in the  
10 necessary number of exploratory wells. Obvious differen-  
11 ces in the nature of the geological structures, they've  
12 found oil there and gas in the Mackenzie -- predominantly  
13 gas, would preclude any detail<sup>ed</sup>/extrapolation or  
14 comparison.

15 I'd just like to finish by  
16 saying that it's apparent that with further exploration  
17 of the remainder of the Mackenzie - Beaufort Basin, a  
18 complex and intricate network of petroleum related  
19 facilities will be constructed throughout the area.  
20 And the basis for this, the evidence -- this evidence  
21 being given now is a report done for COPE with  
22 the same title as the evidence. Thank you.

23 THE COMMISSIONER: Thank you,  
24 Dr. Shearer.

25 MR. BAYLY: Mr. Commissioner,  
26 that report was listed some time ago as a document  
27 in the possession of COPE and I believe, at least  
28 Foothills and Arctic Gas have requested and received  
29 copies of it. Mr. Shearer is now available for cross-  
30 examination sir.



J. M. Shearer  
Cross-Exam by Goudge

1 MR. CARTER: I have no  
2 questions, sir.

3 MR. LUTES: No questions.

4 THE COMMISSIONER: Mr. Ballem,  
5 Mr. Ballem isn't here. Mr. Goudge?

6 CROSS-EXAMINATION BY MR. GOUDGE: Yes, Mr. Shearer,  
7 It's too bad we can't put the figures back up, because  
8 I would like to ask you one or two questions about  
9 figure six. Do you think we could do that?

10 A Sure.

11 THE COMMISSIONER: Nothing to  
12 it.

13 MR. GOUDGE: Mr. Shearer, now  
14 that's figure six, as I understand it, is that correct?

15 A Yes.

16 Q Yes. And you show there,  
17 I take it, just so I'll understand it again, an  
18 extrapolation to indicate the prediction about future  
19 drill holes?

20 A Yes.

21 Q In plotting the drill  
22 holes that you predict, do you simply assume a pro-  
23 portional expansion based on existing drill hole  
24 locations?

25 A To some extent, yes. It's  
26 porportional because I'm assuming the structures aren't  
27 that much larger offshore. The spacing is opened  
28 up a little bit further towards the edge of the basin  
29 on the north because the structures are supposed to  
30 be somewhat larger, therefore, your spacing does not



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Cross-Exam by Goudge

1 have to be as close as it was on land.

2 Q Yes. Is the dotting,  
3 if I can call it that, though, based on specific  
4 seismic information or is it done simply by taking  
5 the siting of existing dots and saying "We have, for  
6 example, so many dots per square mile? "

7 A Not quite like that.  
8 It's not based on seismic information, but it's based  
9 to some extent on the geology which we know exists  
10 offshore. The Kaltag Fault, I've just assumed some  
11 discoveries there, I could be totally wrong, but  
12 I've assumed some there in the Diapir Basin runs off  
13 to the north from Richards Island where they feel  
14 large structures may exist.

15 Q Yes. You're not suggest-  
16 ing though, I take it, that we're to read too much  
17 into the specific placing of any of those dots. It's  
18 representative.

19 A Representative, right.

20 Q And it's simply there  
21 to give us in some very general way an estimate of the  
22 kinds of numbers we might be talking about on your  
23 scenario?

24 A Yes.

25 Q And I take it, you agree  
26 or perhaps you could comment on the opinions we heard  
27 from the industry that any pattern even approximating  
28 that would require substantial success stage by stage?

29 A I think I indicated that  
30 that before they continue -- well, let's assume in





J. M. Shearer  
Cross-Exam by Goudge

1 going offshore, you need a certain discovery rate per  
2 number of holes drilled to, I guess, pay off your  
3 investments so I don't what it is. I don't know if  
4 they would drill fifty holes and then abandon fifty  
5 dry holes and then abandon or ten, and then abandon,  
6 but I know there is a limit that before that number is  
7 reached they would like some discoveries.

8 Q Yes. Perhaps put another  
9 way, what you're representing there is what might be  
10 referred to as the most optimistic picture from the  
11 industry's point of view?

12 A I guess they would be  
13 pleased if that picture came true, although I've --  
14 the frequency of fields shown there represents some  
15 twenty to thirty TCF and their estimates of the  
16 potential are quite a bit higher than that, in fact.  
17 So that in one way, I think they feel that there may  
18 be a lot more there and yet, if they, I guess, knew  
19 now they could discover that, they would be quite  
20 pleased.

21 THE COMMISSIONER: Well they,  
22 the industry says that at Prudhoe Bay they have 27  
23 TCF and you said that's a field 20 by 20 -- 20 miles  
24 by 20 miles -- which would just be a corner of what  
25 you've depicted in this figure which would only yield  
26 even on a reasonably optimistic guess whatever you  
27 said, 20 --

28 A Twenty to thirty trillion  
29 cubic feet, yes. I think --

30 THE COMMISSIONER: So even given





J. M. Shearer  
Cross-Exam by Goudge

1 this projection, they really wouldn't have anything  
2 comparable to Prudhoe Bay at the end of the day?

3 A Yes. I believe that.

4 I believe that the structures are not the same as  
5 Prudhoe Bay and that what they will find are smaller  
6 structures producing less oil and gas per structure  
7 and so that the total in the end would be, might  
8 be somewhere --

9 THE COMMISSIONER: Prudhoe  
10 Bay is only the first field in what they consider  
11 is a series of fields along the north coast of Alaska,  
12 isn't that true?

13 A I'm not quite sure on  
14 that. I'm not really up on that.

15 MR. GOUDGE: But there's no  
16 doubt, Mr. Shearer that Prudhoe Bay is a much more  
17 concentrated and much richer gas bearing area than  
18 the Mackenzie Basin?

19 A Well, Pruhoe Bay is a  
20 has a pay zone of -- a number of pay zones but the  
21 main one, I think is a 400 foot thick sand stone,  
22 roughly 20 miles by 20 miles and what we have in the  
23 Mackenzie, say the Parsons area we have pay zones  
24 between ten -- sandstone beds between ten and twenty  
25 feet thick, up to I think 100 feet thick, covering  
26 a couple of square miles so that there's just an  
27 order of magnitude difference in the size of the  
28 pay zone.

29 Q To return to figure six,  
30 is there any doubt in your mind that we would not end



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Cross-Exam by Goudge

1 up with that picture unless there are very significant  
2 finds made in the very near future?

3 A OK, I'm not sure I quite  
4 understand -- what you're saying is -- are you asking  
5 me if <sup>a</sup>significant find is --

6 Q Without a significant  
7 find in the near future, we will never get to the  
8 picture that you represent in figure six?

9 A I can't say. I just don't  
10 know how long and how much incentive there is to drill  
11 and how many dry holes need to be drilled before  
12 people will be discouraged.

13 Q In referring to figure  
14 six in your evidence, you made some distinction between  
15 exploratory holes beyond the ten meter depth range.  
16 Was there any significance in using the ten meter depth  
17 range as a cutoff point?

18 A Well, I feel that the  
19 ten meter depth range in the Beaufort Sea is very  
20 significant because within the ten meter depth range,  
21 you've got shore-fast ice in the winter time and you  
22 can actually in terms of say relief wells, you could  
23 drill a relief well by building up the ice or just  
24 building it up enough so it touched bottom. Outside  
25 the ten meter line you've got the polar pack moving  
26 at all times so that the logistics of operating outside  
27 the ten meter line in terms of exploratory drilling  
28 is just an order of magnitude greater than inside that.

29 Q I see, it relates to  
30 difficulty of drilling.



J. M. Shearer  
Cross-Exam by Goudoe

1 A Right.

2 Q Could we move to figure  
3 seven which builds on figure six, please? Now, Mr.  
4 Shearer, the representation of facilities that is  
5 contained there is, I understand it, built on your  
6 possible scenario of drilling and discoveries in figure  
7 six, correct?

8 A Yes.

9 Q And, obviously, without  
10 figure six coming to pass/<sup>the</sup> facilities described in  
11 figure seven don't come to pass either.

12 A Of course.

13 Q So that what figure seven  
14 represents is really nothing more than a possible  
15 future scenario for gathering line gas plant develop-  
16 ment?

17 A Yes.

18 Q And the actual/<sup>picture</sup> might  
19 be very different from what is represented in figure  
20 seven?

21 A It might be, yes.

22 Q In terms of the extent  
23 geographically, east to west of the basin you plotted  
24 representatively, do the dots at the west end of the  
25 basin represent your view as to the outer limit of  
26 hydrocarbon bearing potential?<sup>7</sup>

27 A They do. There is in  
28 fact two dry holes there that have been drilled. The  
29 two holes furthest west are -- have already been  
30 drilled and they're dry and I feel that they represent





J. M. Shearer  
Cross-Exam by Goudge

1 the western limit of drilling with any potential.

2 Q Yes. Now what about  
3 offshore?

4 THE COMMISSIONER: Is the border  
5 of the left <sup>side</sup> of this map the international --

6 A Right. In fact the  
7 red --

8 THE COMMISSIONER: Where it  
9 ends there.

10 A Where the basins on the  
11 west side is in fact Lemarkation Bay.

12 THE COMMISSIONER: Right.

13 A Right.

14 MR. GOUDGE: You'll see, sir  
15 that -- or at least I think I can see that there are  
16 no potential discoveries on that west of Herschel  
17 Island?

18 A Right. OK, that's perhaps  
19 an oversight on my part. I didn't continue them over  
20 there.

21 Q Do you have any views as  
22 to the potential hydrocarbon bearing capacity of the  
23 land either onshore or on the --

24 A I wouldn't like to extend  
25 it. Sorry. I wouldn't like to extend the scenario  
26 as shown too much further west than Herschel Island  
27 because I'm not really up on the geology there.

28 Q Yes. Now what about  
29 on the east side of the basin? Where would you put  
30 the outer limit on the east side?



J. M. Shearer  
Cross-Exam by Goudge

1 A Roughly the extension  
2 of Amundsen Gulf that comes very close to Cape  
3 Bathurst and runs in a northwesterly direction, so  
4 it, in fact the map has clipped it off a bit there.  
5 But the holes would continue on the right side of the  
6 map, the holes would continue off the top end of the  
7 map and they would stop on the right side -- right  
8 side of the map near Cape Bathurst.

9 Q Does it approach Banks  
10 Island?

11 A There's another basin  
12 at Banks Island. With the potential between the two  
13 basins, I think very low and so there is --

14 Q Two distinct basins?

15 A Two distinct basins, yes.

16 Q With some substantial  
17 distance of non-hydrocarbon area between them?

18 A Yes, I think so.

19 Q And development in your  
20 view in either basin would be discreet, there's be  
21 no connection?

22 A Well, that's another  
23 whole ballgame. I don't know what would happen in  
24 Banks Island if something was discovered there. I  
25 don't know what they would do with discovered hydro-  
26 carbons there. They might try and tie it in with  
27 something existing in the Mackenzie Basin, I can't say.

28 Q One the points you make  
29 in connection with figure seven is, as I understand it,  
30



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Cross-Exam by Goudge

the desirability of full knowledge of gas location before flowline construction takes place.

A Yes.

Q Is that a concern to you because of the economics of building flowlines?

A That's one concern.

I rather feel that when you discover something, you want to bring it on line as soon as possible and you don't project into the future, or you don't hold it until you feel you've discovered everything to tie it in. The result of doing that is you're going to get criss-crossing and a greater length of flowline than you really need. I don't think there's any way around that.

Q You're not suggesting then, that discoveries be held and not brought into production until all discoveries have been made?

A I'm not suggesting either. I'm just trying to estimate that when discoveries are found in given areas, they will be brought into production.

Q That's just the way of the world?

A Yes. I guess so.

Q Does it create any safety problems that concern you?

A I think that the greater lengths of flowline you have onshore, the greater problem there is. I've gone into what I feel has to be done with the flowlines to allow proper deliverability



and safety in terms of floating ice and integrity of the permafrost. The more lines you're dealing with, the greater probability you may run into problems.

Q I take it you'd agree that it doesn't make sense economically to hold the development of each discovery pending total evaluation of the entire basin?

A I don't want to comment on that because my feeling might be totally different about the basin as a whole. Whether it has to be brought into production at all. But if I assume -- if I assume -- the assumption that I think you're --

Q Assuming that it will be brought into production?

A I agree. Yes.

THE COMMISSIONER: Sorry, where did that leave us then. You finally agreed with what?

A No, I agreed with him.

Q I think, Mr. Shearer, you're prepared to agree with me that it would be uneconomic, assuming that the discoveries are to be brought into production.

A OK, I agree.

Q To wait to build flowlines until all the discoveries in the basin had been made.

A That was worded a little nice, more nice -- I agree with that now, yes.

Q Now turning, sir, to your expertise in ice scour and permafrost in the sea





bed, I have some questions on that. I don't know, Mr. Bayly, if this witness is returning to testify further about that?

MR. BAYLY: He is coming back as I understand, Mr. Commissioner, but I have no wish to retriect my friend's cross-examination if he wants to examine him on that at this point.

MR. GOUDGE: Well, let me ask the questions now, then, sir. You may find, Mr. Shearer, me asking them again, if I'm permitted to. To begin, you have considerable experience, as I understand it, in studying scour of ice on the sea bed?

A Yes. I spent a number of years offshore on the Beaufort Sea doing work on evidence of scouring bottom and rates of scouring and this sort of thing.

Q You said, I believe that scour depths can occur to between twenty and thirty feet?

A This is -- I'll just get straight some terminology here. Scour depth into the bottom -- in other words, the possible relief in the bottom due to ice running aground has been found to be up to thirty feet. Although we're not quite sure of the age and when it happened but we have evidence of up to thirty of scouring into the bottom.

Q You've discovered no evidence anywhere in the Beaufort of scour depths into the bottom to depths greater than thirty feet?



J. M. Shearer  
Cross-Exam by Goudge

Q:

A No. /In fact, the average depth -- the average depth on the long side would be in the area of twenty-five feet, I take it. A No the average depth is quite a bit less. It's probably in the order of six feet -- six to eight feet. But, with quite frequent, say 5 per cent of them being in the 15 to 20 foot range.

Q Do you have any way of plotting the frequency of the 15 to 25 foot range?

A You mean sort of a histogram of the number scours seen in the 15 to 20 foot range versus the other ones?

Q Have you done it that way, I'm sorry I didn't --

A Yes. Yes, it has been done that way.

Q And, do you quantify the result of that comparison? And if so, what is it?

A I'm not quite sure I understand the question.

Q Well, how often do you get scour depths of 15 to 25 feet as opposed to --

A Well I thought I just said, it's roughly five per cent.

Q Five per cent.

A Yes.

Q I'm sorry, I didn't catch that. What about a geographic distribution of the 15 to 25 foot scour depths? Have you plotted that?



J. M. Shearer  
Cross-Exam by Goudge

1 A No, we haven't. At this  
2 point, we've just plotted up the distribution on the  
3 Continental Shelf of where scouring has occurred and  
4 some directions. Our first concern was to what depth --  
5 what water depth scouring occurred.

6 Q Well, let's start there.

7 A We've noticed scours  
8 up to, I think, 160 feet and maybe even greater. The  
9 age of these scours we feel, is quite a bit older than  
10 say happening in the recent past. In the last ten  
11 or twenty years and --

12 Q What do you mean by "age"?

13 A Well, we feel that the  
14 scours might/<sup>have</sup> occurred -- scouring might have occurred  
15 five, six, seven, eight thousand years ago. Their  
16 record -- the scouring that happened that long ago  
17 would still be observed in the seismic records we've  
18 taken. They may be filled in a little bit with mud or  
19 filled in quite a lot, but they would still be there.  
20 So it's a matter of trying to figure out how old  
21 these things are. We've noticed some very fresh  
22 ones. We don't know, again the time, but we feel  
23 they must be within the last ten or twenty years.  
24 We've also done some resurveying of a number of areas  
25 with the side scan sonar and noticed additions of  
26 scours in two years.

27 Q What's the water depth  
28 maximum that in which you find this active scouring  
29 going on?

30 A Seventy -- about seventy





J. M. Shearer  
Cross-Exam by Goudge

1 feet is the deepest one we've noticed. This doesn't  
2 mean it doesn't happen in greater water depth. We  
3 just haven't been able to run resurvey areas that we've  
4 done in deeper water. I feel it does happen in deeper  
5 water but we -- we're not totally positive about that.

6 Q So your actual observations  
7 run to seventy feet for active scouring on the deep  
8 side.

9 A Right.

10 Q What do they run to on  
11 the shallow side? Is there any minimum depth?

12 A There's no minimum depth.  
13 I think the actual intensity of scouring is highest  
14 beyond the ten meter line because it happens in winter  
15 time when the Arctic pack ice is in close, with a lot  
16 of momentum. The shore-fast ice literally protects  
17 zero to ten meter line from very heavy -- very heavy  
18 scouring. Although, there is, in the summertime you  
19 can get pieces of ice right on the beach that can do  
20 some -- hit the bottom and do some -- do some scouring.

21 Q But the really active  
22 scour pathway, so to speak is between depths of  
23 thirty feet and seventy feet, approximately.

24 A I would say thirty feet  
25 and a lot more than seventy, although there is no --  
26 there is no proof right now, of what the outer limit --  
27 no knowledge of what the out limit is.

28 Q Now, is there any general  
29 direction in which the scour marks run?

30 A I think the general direction



J. M. Shearer  
Cross-Exam by Goudge

is east -- east-west. Somewhat the average direction of the -- the Beaufort Gyre. I would like to have some figures here to support this. I guess next time, we'll -- the next panel dealing with this will have some figures to show -- answer some of these questions. I feel a little lost without figures.

Q Well, I don't want to press you when you have figures that you'd prefer to bring back, so let me just ask or one or two other conceptual questions about sea ice scour. Is it true that there are any protected areas within the thirty foot, seventy foot and beyond zone where ice scour does not occur?

A It's somewhat logical that wherever you've got a depression in the bottom, having the bottom somewhat as the inside of a bowl, you're not going to get ice getting in there. There are various areas offshore. There's an old channel that runs out the old East Channel.

Q That's an old channel of the Mackenzie?

A I think an old channel of the east channel of the Mackenzie, right. It's not totally protected but because it runs in a north-south direction and the ice doesn't get in there in frequency, that it would get in if it was flat. Herschel Basin, just inside Herschel Island is a very deep basin to 200 feet in the deepest entry into the basin is -- I'm not quite sure of the figures -- 50 feet or something like that. So that you're not going



J. M. Shearer  
Cross-Exam by Goudge

1 to get ice doing anything on the bottom there, be-  
2 cause it can't get in there.

3 Q Is it possible that  
4 pipelines could be laid along these depressions, in  
5 a way that would make them immune to ice scour?

6 A I think, in fact, this  
7 is the way to do it. I don't think you're ever 100  
8 per -- well, you might become 100 per cent protected.  
9 I think we need to do more work to find out where  
10 there is, in fact, no scouring at all. You could then,  
11 perhaps assume that you're not going to get any and  
12 you might not have to bury it. You might not have  
13 to bury it so deep and hence avoid this problem.

14 Q Those are two directions  
15 in which solutions might be found to ice scour. One  
16 is burial beyond the thirty foot limit and the other  
17 is by routing under water?

18 A Yes, I think that your  
19 natural depressions and your natural old channels  
20 offshore probably don't run right into where your  
21 hydrocarbon discoveries are going to come so that  
22 you're going to have to deal with this problem. You  
23 may in fact, be able to shorten your length of burial  
24 by running from hydrocarbon discoveries to these --  
25 these naturally depressed areas where scouring doesn't  
26 occur in such frequency.

27 Q Now, let me turn, if I  
28 might to permafrost under the sea bed. As I understood  
29 you, you expressed a concern about ice rich permafrost  
30 under the sea bed -- just under the sea bed, if I can



J. M. Shearer  
Cross-Exam by Goudge

1 put it that way.

2 A Yes, within thirty feet  
3 of the surface.

4 Q Do you know whether any  
5 detailed knowledge exists as to the distribution of  
6 that permafrost at that shallow depth?

7 A There's some knowledge  
8 of distribution of offshore permafrost and I think  
9 it's in the works now, working out the exact depth  
10 to the top of the permafrost. Even when that is done,  
11 it's based on line spacing which is quite far apart  
12 so that the map will in no way be detailed enough to --  
13 we would need a lot of very detailed survey work to  
14 plot it accurately enough for the feeder line problem  
15 we've got.

16 Q Is it your view that there  
17 are many areas in the basin you've described where the  
18 permafrost is within thirty feet of the sea bed?

19 A It is. I think I might  
20 have forgotten to say when I was talking. But I  
21 think Mackenzie Bay is -- seems to be at this point  
22 somewhat safe in terms of offshore permafrost. A  
23 line running somewhat north northwest of Garry Island  
24 from there over to the west side of Mackenzie Bay, I  
25 think, is quite free of permafrost. From there over  
26 to the east I've noticed personally -- this is, of  
27 course, not proven but it's based on interpretation  
28 of high frequency seismic records.

29 Q It's true, is it not  
30 though that in many areas, the permafrost is well





J. M. Shearer  
Cross-Exam by Goudge

1 below thirty feet below the sea bed?

2 A I know it is below --  
3 well below in a number of areas. I wouldn't like to  
4 say many, but I would agree that there are areas where  
5 it's well below.

6 Q Well then, perhaps we  
7 can agree that before the magnitude of this particular  
8 problem can be evaluated, more information will be  
9 needed as to distribution of permafrost near the sea  
10 bed?

11 A Yes.

12 Q What about information  
13 related to the ice richness of the permafrost? Are  
14 you familiar with how much information exists on that  
15 subject?

16 A I think in fact, very  
17 little exists because it's -- one needs to drill,  
18 I think, pretty well drill into it to find out how  
19 much segregated and ground ice there is in it, because  
20 in terms of interpreting high frequency seismic records,  
21 frozen ground and ice rich frozen ground won't show  
22 up much differently.

23 Q Can you make a quantified  
24 comparison as to permafrost knowledge onshore and off-  
25 shore on that subject. Isn't it true that there is a  
26 vast difference?

27 A There's two main reasons  
28 for permafrost offshore. One of them is the -- when  
29 the glaciers covered North America 15 thousand years  
30 ago, the Continental Shelf was exposed to low mean



J. M. Shearer  
 Cross-Exam by Goudge

1 annual air temperatures as the Tuktoyaktuk Peninsula  
 2 is now, so you had permafrost developing on the shelf  
 3 to a thousand and plus feet of thickness and, assuming  
 4 the parallel, you<sup>would</sup> get a lot of the areas with high  
 5 ground ice and a lot of segregated ice, so that I feel  
 6 that offshore there is a lot of ground ice and seg-  
 7 regated ice. As the glaciers melted and the sea  
 8 transgressed over the shelf, you had some melting when  
 9 the seas were very shallow. At any given point, the  
 10 seas transgressed. When they transgressed and they  
 11 were only, say, sea level to twenty meters deep, the  
 12 temperatures were higher than say they are at fifty  
 13 meters of water depth, now. So there was some melting.  
 14 A zone of melting -- transgress a zone of melting as  
 15 you -- as the sea progressed inland or as the sea  
 16 rose.

17 So that a lot of this potentially  
 18 high rich ground ice material would have melted and  
 19 it has refrozen now in areas we feel beyond the  
 20 twenty meter water depth line because the temperature  
 21 is -- the mean annual temperature of the bottom  
 22 waters are minus 1.5°C and the area is -- the area  
 23 under the bottom -- the sediments under the bottom  
 24 are saturated with fresh water, fresh water sediments.  
 25 So that we feel <sup>that</sup> if this refreezes, due to the minus  
 26 1.5 temperature on the sea bottom, you would expect  
 27 less ground ice and less segregated ice to form  
 28 under those temperatures than if they were much lower.

29 Q But there's no doubt  
 30 that there's a real information gap as to the degree of



J. M. Shearer  
Cross-Exam by Goudge

1 ice richness of the permafrost under the sea bed?

2 A Yes.

3 Q Far more of a gap than  
4 there is as to the degree of ice richness of permafrost  
5 on land?

6 A Oh, yes.

7 Q And isn't it true that  
8 we need to know a great deal more about both the  
9 depth of the permafrost under the sea bed and the  
10 degree of ice richness of that permafrost before we  
11 can determine the magnitude of the problem it presents  
12 for flowlines?

13 A Basically, I agree, yes.

14 Q Obviously, if the  
15 permafrost is well under the sea bed in widespread  
16 areas, or if it's not ice rich, there is no problem  
17 for flowlines?

18 A And it's not ice rich --  
19 there's no problem. Yes.

20 Q But we just don't know  
21 enough at the moment.

22 A Right.

23 MR. GOUDGE: Those are all  
24 the questions I have, sir.

25 THE COMMISSIONER: Dr. Shearer,  
26 where the basin pitches in off the Yukon coast, is  
27 that because the geology ends out there, or is it  
28 because the depths of the water falls off so quickly,  
29 that even if the geology indicates that it is hydro-  
30 carbon bearing, it is impractical to get at it.





J. M. Shearer  
Cross-Exam by Commissioner

1 I didn't quite follow the point that you made there.

2 A There are large  
3 thicknesses of mesozoic and cenozoic rock running  
4 north beyond that dark red line, which I say is the  
5 edge of the tertiary basin edge and the water depth  
6 drops very quickly there to 500 meters and I have  
7 taken that as an arbitrary edge. Even at that point,  
8 the real basin edge where the sedimentary rocks thin  
9 out and I think the petroleum potential is very low,  
10 might be another 30 or 40 or 50 miles beyond that.  
11 Like it doesn't go for another 500 miles with the  
12 potential being very high, but the water depth being  
13 too deep.

14 THE COMMISSIONER: Right.  
15 Now the proposed deep water drilling that DOME wants  
16 to carry out is within about what depth of water?  
17 100 feet?

18 A One of the holes, I  
19 think is in ninety feet of water. The other is in  
20 100 -- 160 to 180, in there somewhere.

21 THE COMMISSIONER: So that  
22 you're saying that even if the techniques they pro-  
23 pose to use prove to be practicable, they would  
24 not allow the drilling of wells at a depth of 500  
25 meters? I take it your assumption is that their  
26 techniques in 100 to 150 feet of water may well  
27 turn out to be practicable but that once you get to  
28 500 meters, there's no foreseeable technology that would  
29 enable you to drill and extract the oil and gas.

30 A I think on of the main



J. M. Shearer  
Cross-Exam by Commissioner

1 reasons for feeling that, I agree with you, yes, is  
2 that you're a long way offshore when the water is  
3 deep and the -- in fact, your summer drilling season  
4 is almost nonexistent in that depth. The outer edge  
5 of the polar pack in the summertime coincides roughly  
6 with the outeredge of the basin shown coincides with  
7 where the dropoff from the Continental Shelf to the  
8 ocean -- to the Continental Slope occurs. So that --

9 THE COMMISSIONER: The  
10 red line mark "the tertiary basin?"

11 A That's right, the one  
12 on the top.

13 THE COMMISSIONER: Yes.

14 A Beyond that the polar  
15 pack, I don't think, gives you very much time at all  
16 to do any drilling unless you develop something to  
17 drill totally subsea.

18 THE COMMISSIONER: Right.  
19 I gather from April, 1974 to January, 1975, you were  
20 with the Beaufort Sea project?

21 A Yes.

22 THE COMMISSIONER: And, you  
23 were chief scientist on the "Pandora." Was that one  
24 of the vessels the project was using?

25 A Yes.

26 THE COMMISSIONER: And in  
27 that connection you were examining scour. That was  
28 your corner of the project, was it?

29 A Yes.

30 THE COMMISSIONER: Right.



J. M. Shearer  
Cross-Exam by Commissioner

1 Well, those are all the questions I have. Maybe  
2 we should -- any re-examination, Mr. Bayly?

3 MR. BAYLY: I have no re-exam-  
4 ination, Mr. Commissioner.

5 THE COMMISSIONER: Well, maybe  
6 we could adjourn for a few minutes for coffee and  
7 turn the lights on. Thank you very much Dr. Shearer.

8 WITNESS SHEARER: You're  
9 welcome.

(WITNESS ASIDE)  
10 (PROCEEDINGS ADJOURNED FOR A FEW MINUTES)

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D.R. Shaw  
In Chief

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

THE COMMISSIONER: Well, we will come to order again, and Mr. Bayly, when your witnesses are reading their prepared evidence, you might have them just go through their curriculum vitae as well, because it helps me and I'm sure it helps everyone else to kind of have that in their minds when the witnesses go through their testimony. Dr. Shearer, I think, through modesty that was becoming but and altogether admirable didn't and perhaps you could have the others do so, if you don't mind.

MR. BAYLY: Yes sir.

THE COMMISSIONER : If you don't mind.

D.R. SHAW, sworn:

DIRECT EXAMINATION BY MR. BAYLY:

Q Perhaps we could file his so that there is some record of it with the Inquiry and I will ask Mr. Shaw then who I understand has been sworn if he would begin by reading his curriculum vitae and then we will go into his evidence. Could you do that, Mr. Shaw, please?

A Sure. I think instead of using the terminology, "Mr. Shaw", I will just say "I" and give a brief history.

My present position is chief chemist for the Energy Resources Conservation Board and our lab is in the Engineering Building, the Chemical Engineering Building at the University of Alberta.

I am also appearing here





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1 as a private citizen rather than officially representing  
2 the Conservation Board.

3 I began working in the  
4 Turner Valley oil and gas field in early 1942 as a  
5 labourer at what was then the British American Oil  
6 Co. gas plant at Longview. There I held a variety of  
7 jobs: store-man, field-gauger, instrument mechanic,  
8 and other positions. After service overseas with the  
9 Canadian Army Active Forces I returned to British  
10 America as a high pressure compressor operator.

11 I then attended the  
12 University of Alberta and obtained a B.Sc. in Honors  
13 Chemistry in 1950. During this period, I worked  
14 during the summer for Consolidated Mining and Smelting and  
15 as a mud-man for Commonwealth Drilling, and also as  
16 a "roughneck" for Commonwealth Drilling. After 1950  
17 I went to the University of British Columbia and did  
18 some work towards a Masters' degree in chemistry.

19 Q Mr. Shaw, excuse me, could  
20 you go a little bit slower so that the reporters could  
21 pick this up, sir?

22 A I'm sorry. It didn't interest  
23 me so I was going rather fast.

24 All right. I left U.B.C.  
25 to work in the pulp and paper industry as a pulp tester  
26 and as a chemist.

27 In 1953, I returned to  
28 Alberta and worked as a mud-man for various companies.  
29 In 1955 I began working for the Energy Resources  
30 Conservation Board -- it was called the Oil and Gas



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1 and the Petroleum and Natural Gas Conservation Board  
2 at that time. I have been with the Board ever since.  
3 During the past two years, I began a study programme  
4 that would have led to an M.Sc. in zoology  
5 at the University of Alberta. However, the exigencies  
6 of the present employment did not leave me sufficient  
7 time to work up a day with about 28 hours in it and  
8 so I couldn't manage to do proper justice to it so I  
9 withdrew as a candidate.

10 Q Would you list the  
11 oil and gas field problems that you are most commonly  
12 involved with during the course of your work in Alberta?

13 A Yes, in general, my work  
14 relates to various aspects of the impact of the oil  
15 industry upon the environment, with particular interest  
16 in industry's practice of:

17 (a) oil spill clean-up, prevention, and  
18 restoration;

19 (b) salt water spill clean-up, prevention, and  
20 restoration;

21 (c) sump fluid disposal;

22 (d) general housekeeping -- on and off lease; and

23 (e) oil spill contingency preparedness.

24 I also have occasion to  
25 become directly or indirectly involved in various re-  
26 search aspects of rehabilitative schemes where  
27 hazardous materials have been spilled. This includes  
28 investigations of subjects such as:

29 (a) the extent to which fertilizers can aid  
30 rehabilitation;



(b) the best method of overcoming oil spills on arable land;

(c) how best to handle oil spills on muskeg areas;

(d) how to aid recovery after a salt spill;

(e) the proper use of chemicals as a distinct aid to site clean-up in relation to oil spills;

(f) the development of oil spill containment techniques as applicable to lakes and streams in winter and summer;

(g) line break detection in summer and winter;

(h) the restoration of spill sites; and

(i) the possibility that bacteria inside or outside of<sup>a</sup> pipeline are capable of greatly increasing the rate of corrosion and hence generating line failures.

Work in these subjects has required me to become deeply involved in evaluation of the toxicity of various wastes, effluents, and spills, as well as the toxicity of chemicals and detergents in normal usage.

Q Mr. Shaw, you used the word "toxicity". Will you explain what you mean when you use this word?

A Yes, the term "toxicity" or "toxic" does not necessarily imply death of an organism, but does signify that a plant or animal was disadvantaged. Sometimes this disadvantage may be great enough to cause death of the organism. In the testing that I have done it has been the usual practice to test various concentrations of materials in water by aerating and cooling the solution and then





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1 adding rainbow trout (*Salmo gairdneri*, Richardson).  
2 Care is exercised to ensure that no ocean-run  
3 strains of trout are used for test purposes.

4 I should also add that  
5 materials at concentrations that do not kill fish within  
6 a certain time limit can not be considered as non-toxic  
7 only as relatively less toxic than substances  
8 which kill more readily.

9 Q If we consider oil and  
10 gas field development generally, without reference  
11 to any particular field, what kinds of fluids are  
12 brought to the surface during production?

13 A Formation fluids consist  
14 of mixtures of hydrocarbons and salt water, and may  
15 also contain various <sup>amounts of</sup> sulphur compounds such as hydrogen  
16 sulphide and mercaptans. These components may be  
17 present in almost all conceivable proportions --  
18 some formation fluids contain no water, some are all  
19 water, some consist of only light hydrocarbons; that is,  
20 that they are natural gas, some only very heavy hydro-  
21 carbons, and finally these fluids may be sour; that is,  
22 containing sulphur compounds, or contain no sulphur  
23 compounds and are referred to as being sweet. This is  
24 largely dependent upon the formation of origin.

25 Q Mr. Shaw, what is the  
26 significance of this variability and complexity of  
27 formation fluids when it comes to spills and their  
28 treatment?

29 A Unfortunately a spill of  
30 formation fluid will often consist of more than a crude



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1 oil spill problem. Each of the major components of  
2 the fluid can generate its own set of unique problems.  
3 The causes of these problems often obscure each other  
4 to the extent that what appears to be a simple oil  
5 spill may not respond to treatment. Examination  
6 and analysis may show for example that the oil spill  
7 also contained a salt spill. The salt could have been  
8 present in the crude oil as free brine, or as  
9 emulsified salt water, or as suspended micro-crystals  
10 in the oil. A high concentration of salt in the oil  
11 could have a serious effect on the rehabilitation  
12 programme. Crude oils have been tested which contained  
13 20,000 lbs. of salt per 1000 barrels of crude oil.

14 A crude oil spill may  
15 therefore consist of three intertwined problems:

- 16 A. A hydrocarbon problem.  
17 B. A mercaptan and hydrogen sulphide problem.  
18 C. A salt problem.

19 Q Would you describe the  
20 hydrocarbon problem in more detail?

21 A The hydrocarbons in  
22 crude oil are present in a variety of forms; some  
23 are volatile, some are waxy solids, and some are  
24 tarry solids, depending upon the kind of crude oil  
25 that is involved. Crude oils may be categorized as  
26 several types:

- 27 1) paraffinic;  
28 2) naphthenic;  
29 3) aromatic;  
30 4) asphaltic.



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Each of these types of crude oils has a light (gasoline like) fraction and heavy (oily, tarry, or waxy) fractions. Each fraction has a different solubility in water, and usually this appears to modify the overall undesirable effects on various species of animals and plants encountering the crude oil.

I would not presume that all water soluble hydrocarbons are toxic and conversely that all water insoluble hydrocarbons are non-toxic. Generally speaking, condensates, light hydrocarbons, l.p.g.'s, light gasolines, -- l.p.g.'s incidentally are liquified petroleum gases -- light gasolines, etc., are much more toxic than the heavy straight run diesel fuels, lube oils, and so forth quite probably due to the high proportion of low molecular weight very soluble material present in the lighter fractions. In practice you must be careful; for example, one product, a straight run winter diesel fuel, from a paraffin base crude, is toxic only at relatively high concentration in the order of 300 mg/litre. Conversely a summer diesel from the same paraffin base crude has a higher concentration of unsaturated hydrocarbons because it is a blend of straight run distillate plus a cracker stock and possibly even a reformer run. The different blend stocks each have different toxicities, depending on the conditions of the run, the input material and the proportions of each in the final blend. The components of diesel fuel also differ in toxicity to animals depending on the seasons of the year, the





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1 sex and development of the animals affected and even  
2 the amount of natural oil present in the animal.

3 The toxicity of hydro-  
4 carbons is closely allied to the hydrocarbon structure.  
5 We all know that a refined wax floating on water will  
6 not immediately adversely affect the fish in the water,  
7 whereas a gasoline layer on the water will probably  
8 adversely affect the fish. It is also evident that  
9 the toxicity of hydrocarbons can be related to factors  
10 other than their direct solubility in water. For  
11 example, animals that are oil wettable such as most in-  
12 sects and many insect larvae seem to die very quickly  
13 in oils. Oil is easily absorbed, either through the  
14 intact cuticle or via the spiracles; or is ingested  
15 by the animal grooming itself (by licking itself) or  
16 is eaten with its food. In some cases animals may  
17 think that the oil is food. In the case of the animal  
18 eating the oil, the gut of the animal may partially  
19 or wholly metabolize the oil, or may detoxify it by  
20 various mechanisms. Mammals like domestic cow can  
21 drink large quantities of crude oil and survive  
22 provided that all of the oil enters the stomach. The  
23 animal will however, suffer for a time from diarrhea.

24 It seems evident that  
25 animals which are invariably water wet, such as fish,  
26 will not suffer by being coated with oil, mostly  
27 because they cannot be coated. However, the soluble  
28 hydrocarbons can be absorbed, probably (most easily)  
29 via the respiratory system. The secondary toxic  
30 effect on fish is due to swallowing oily particles,





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1 either composed of oil or of oiled insects or plant  
2 food. The effect of this ingested oil does not appear  
3 to me to be evident as quickly as the previously men-  
4 tioned direct absorption of dissolved material. There  
5 is of course a tertiary effect which can cause great  
6 discomfort and even death to fish and aquatic insect  
7 larvae, and that is the reduction of available oxygen.  
8 If an oily layer covers a pond , oxygen is prevented  
9 from redissolving in the water, therefore, a state  
10 of oxygen shortage may develop. Less complex  
11 organisms (particularly algae) that normally would  
12 produce oxygen, then die (either due to toxic effects  
13 or blockage of sunlight by the oil layer), hence they  
14 do not produce replenishment oxygen.

15 The dead algae then decay  
16 and thus create a high biological oxygen demand,  
17 therefore creating an even greater oxygen shortage.  
18 The new environment so created may be effectively  
19 anaerobic and therefore it is believed that mobile  
20 species (such as fish) will move from the contaminated  
21 area.

22 Animals that inadvertently  
23 eat the oil often try to detoxify the oil by various  
24 mechanisms. The type of detoxification attempted by  
25 the animals depends on the nature of the substance,  
26 the manner of entry to its system, and in some cases  
27 the amount entering. There are probably many more  
28 governing factors such as age or sex of the  
29 animal, time of the year, and the fat content of the  
30 animal and so on. However the animal system usually



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1 makes some attempt to detoxify the material by adding  
2 another chemical such as for example natural sugar to  
3 the chemical and then by excreting it (changed or  
4 unchanged). Sometimes the animal system destroys  
5 itself by mistaking one chemical for another and  
6 building an enzyme blocking chemical in an effort at  
7 detoxification or by building a carcinogen instead of  
8 an excretable material. In the case of the cow, the  
9 crude oil that is swallowed appears to go into the  
10 stomachs . There it interferes with normal bacterial  
11 activity associated with digestion and is rapidly passed  
12 on to the intestines. There it seems to act as an  
13 aperient. However, sometimes the cow dies very  
14 quickly due to relatively small amounts of oil. It  
15 has been shown by Dr. Beck, that an animal that breathes  
16 in as little as a half a cup of crude oil will  
17 probably very soon die of some form of pneumonia.

18 For animals that do  
19 become oil wet, such as muskrats, beaver, ducks, geese,  
20 and other water birds it is important to understand  
21 why a coating of oil on fur or feathers will be a  
22 cause of death. Unfortunately, when fur or feathers  
23 are matted together with oil, the elements can make  
24 an impression on the bare skin of the animal. Oil  
25 can be absorbed through the skin, but by far the  
26 larger effect generally is the one of exposure, since  
27 the skin of an oiled animal makes direct contact  
28 with the elements without intervening insulation.

29 Q Is there anything that  
30 can be done to counteract some of these undesirable



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1 environmental aspects of the hydrocarbon problem?

2 A Volatile hydrocarbons  
3 can be removed from the water by passing a current  
4 of clean air through the contaminated water. A large  
5 proportion of the volatile hydrocarbons will be swept  
6 out with the effluent air.

7 Oiled animals should be  
8 washed free of oil, dried, fed, and when back to  
9 normal, released in an area free of oil. The animal  
10 if properly treated will very often survive. Oiled an-  
11 imals react to oil by increasing their metabolic rate  
12 in order to keep themselves warm and possibly in a  
13 defence mechanism similar to the one which produces a  
14 fever in man when he has an infection. The increase  
15 in the heat output uses up stored fat, and eventually  
16 muscle tissue, and unless the animal is fat and well  
17 favoured, and not frightened to death, it will soon  
18 perish.

19 The action of washing an  
20 animal so that it becomes free of oil has certain  
21 hazards associated with it. One must:

22 1) ensure that the mammal or bird, tranquillized  
23 or not, does not breathe in the oil or the oily soapy  
24 water;

25 2) be very careful to rinse away all the oily  
26 soapy water from fur, feathers, and skin;

27 3) exercise care in disposal of the oily soapy  
28 water since a mixture of oil and detergents in water is  
29 usually much more toxic than either the oil in water or  
30 the detergent in water are by themselves. Generally





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1 speaking the cumulative effect is synergistic rather  
2 than additive. Disposal of oily soapy water should  
3 be to a dry land surface which is supporting a grass  
4 or other crop. Detoxification by soil bacteria,  
5 sunlight and air will generally proceed fairly rapidly  
6 in such a safe place; and finally,

7 4) handle wild animals very cautiously because  
8 they cannot understand or appreciate our actions, and  
9 generally must interpret handling as some form of  
10 aggression. They therefore retaliate and react against  
11 the rescuer as if he were a predator. The result can  
12 be damaging to the rescuer, but of greater importance  
13 is the probability that the animal may die of shock  
14 and mis-handling. Be gentle, or your concern and  
15 effort will go unrewarded insofar as saving the life  
16 of the affected animal.

17 Another solution to  
18 pollution is to generate and use only those materials  
19 which have a minimal effect on the environment. This  
20 activity might even best be performed by the manufac-  
21 turers. They can often remove dangerous trace compon-  
22 ents or by-products if the customer requires that this  
23 be done prior to purchase.

24 Q Earlier you referred to  
25 the mercaptan and hydrogen sulphide problem. Can you  
26 explain why these chemicals are of concern?

27 A Generally speaking, the  
28 content of hydrogen sulphide (and that could be  
29 written  $H_2S$ , or if you wish, spread that out and write  
30 HSH) and therefore mercaptan -- you can look at a



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1 mercaptan as being a substituted hydrogen sulphide with  
2 one of the hydrogens replaced with a group which I  
3 shall refer to as R and therefore in the future I will  
4 refer to mercaptans as RSH, so it is kept as low as  
5 possible in most materials shipped by pipelines because  
6 these materials are corrosive. The exception is of  
7 course that transmitted gas for domestic heating is  
8 odorized for safety. Fortunately, RSH and similar  
9 compounds are very easily detected by us, therefore  
10 the level of RSH in commercial gas is kept quite low  
11 (in the region of 10 ppm). However, the raw product  
12 streams from well heads and flow lines etc, may contain  
13  $H_2S$  and RSH, and these compounds are very toxic.

#### 14 The Worker's

15 Compensation Board of Alberta classes hydrogen sulphide  
16 gas as "one of the most vicious and deadly hazards in  
17 Alberta." A hydrogen sulphide victim may suffer little  
18 or/<sup>no</sup> lasting ill effects if moved into fresh air and  
19 given artificial respiration. The odor is a warning;  
20 its disagreeable nature (the smell of rotten eggs)  
21 warns animals of its presence. If, in spite of the  
22 warning, the animal chooses to disregard the offensive  
23 odor, then the animal will loose its sensitivity to  
24 the odor of hydrogen sulphide. The animal may then  
25 totally disregard the originally noticed warning  
26 odor, remain in the area of high concentration and if  
27 the hydrogen sulphide concentration is great enough the  
28 animal will die. Man, although not as sensitive to  
29 odors as other animals, is still subject to loss of  
30 odor sensitivity as are the other animals, and



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1 consequently to a similar loss of life.

2 Hydrogen sulphide and the  
3 chemically similar mercaptans (RSH) are  
4 poisonous to most fish and most invertebrates at levels  
5 of 1 or 2 ppm in water or less. Unfortunately, the low  
6 molecular weight mercaptans and hydrogen sulphide are  
7 quite soluble in water (up to 6649 ppm of hydrogen  
8 sulphide is soluble in water at 0 degrees Centigrade or  
9 Celsius) and hence is very effective as a poison. Con-  
10 densates containing hydrogen sulphide and mercaptans  
11 when spilled on or into water, make contact with the  
12 water and the hydrogen sulphide and mercaptans dissolve  
13 very readily into the water. That's provided of course  
14 that you are not dealing with high molecular weight  
15 mercaptans. The resultant water can then be very  
16 toxic to aquatic life even after total removal of the  
17 hydrocarbon from the surface.

18 Q Mr. Shaw, what can be  
19 done to counteract these problems with hydrogen  
20 sulphide and mercaptans?

21 A The only method of removal  
22 of some of the sulphur compounds is by air stripping.  
23 This will also remove much of the dissolved hydrocarbons.  
24 Therefore if a perforated compressed air line is put  
25 into the water, some of the poisonous sulphur compounds  
26 and the soluble hydrocarbons will strip out with the  
27 air.

28 Q Could you describe the  
29 salt problem in more detail?

30 A Salt is always present





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1 in formation fluids, and may be the major portion of  
2 the fluid if brine only is produced, or it may be  
3 present in crude oils and condensates in what can be  
4 considered to be two forms: as a crystalline or micro-  
5 crystalline solid suspended in the oil, or as water  
6 solution. On contact with the water in the environment  
7 whether that water is interstitial water in soil, sur-  
8 face water of a stream, slough or lake, or precipita-  
9 tion as rain or snow, the salt will appear in the fresh  
10 water and contaminate that water. The salty water  
11 must then be considered in much the same way as a salty  
12 formation fluid spill must be considered.

13 Salt water may come from  
14 several sources:

- 15 a) from spilled crude oil or other hydrocarbons;  
16 b) from production tank bottom sludge, called  
17 B.S. & W.;  
18 c) from reproduced water or sludge;  
19 d) from disposal or injection line breakage;  
20 e) from sump fluids accumulated during well  
21 drilling.

22 Whatever the source, it  
23 is critical to know how concentrated the salty material  
24 is, since the method of rehabilitation is adjusted  
25 according to the volume and salinity of the water  
26 involved.

27 The biological effect  
28 will also depend on the volume and salinity of the water  
29 solution; therefore, it is important to know how much is  
30 being dealt with and of what concentration. The follow-





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1 ing examples will illustrate.

2 1) a small oil spill into a small slough has  
3 occurred. The salt content of the oil is found to  
4 be 100 lbs/1000 barrels; but the spill is only 100  
5 barrels; the slough is 300 feet long by 100 feet wide  
6 by 4 feet deep in the centre. And if we assume that  
7 the slough gets shallow, from shallow at the edges  
8 and comes down to the basin, then we would multiply  
9 these figures out and divide by 2 and multiply by  
10 6.25 and end up with the number of gallons. In this  
11 case, it is 375,000 --  $300 \times 100 \times 4 \times 6.25$  divided by  
12 2. The amount of salt in the hundred barrels which  
13 was mentioned previously is one-tenth of 100 pounds  
14 which is 10 pounds of salt. Therefore the crude oil,  
15 because, you see, we had 100 pounds of salt in 1000  
16 barrels but we are only dealing with 100 barrels you  
17 see so we have got 10 pounds now of salt. Therefore  
18 the crude oil spill of 100 barrels of crude oil into  
19 the slough may put 10 pounds of salt into the solution  
20 and the 375,000 imperial gallons of slough water.  
21 This amounts to about 3 ppm of salt and will pose no  
22 problem.

23 2) Conversely, a large oil spill into the same  
24 slough consisting of 10,000 barrels of oil containing  
25 1500 pounds of salt per 1000 barrels. In this case,  
26 there 15,000 pounds of salt dissolved in 375,000 im-  
27 perial gallons of slough water. This amounts to  
28 15,000 pounds of salt in 3,750,000 pounds of water. The  
29 resultant concentration is then about 4000 ppm of salt  
30 and will be a problem to many plants and animals.



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With these points in mind we must also realize that the salty water can affect everything that comes in contact with it. Mammals may drink it; fish of course can not escape, and neither can the fish food organisms. If the salty water goes on the land, we must appreciate the fact that the animals and the soil will also be affected, as of course may be the plants.

Q Mr. Shaw, what are some of the effects of salt on animal and plant life?

A Much work has been done in Southern California and Australia on the salt problem in relation to livestock. Sheep can stand the highest concentration of salt in the drinking water, about 10,000 ppm of dissolved salts. Next would come cattle and horses at about 8,000 ppm, then pigs at about 6000 ppm. These levels eventually induce a weight loss and interfere with food assimilation and weight gain and eventually the animal would lose weight and vigor to the point of emaciation and probably death.

Ducks appear to be able to stand about 5,000 ppm, while turkeys and chickens as adults can tolerate about 3,000 ppm. Turkey poults begin to die at 1800 ppm.

Fish can sometimes tolerate considerable quantities of salt, not simply if they are ocean fish, but fresh water fish. Some, (like the rainbow trout as adults) can stand concentrations approaching 20,000 ppm.



I have found aquatic invertebrates to be very sensitive, so much so that I hesitate to use them as a test species to determine toxicity. Generally speaking the food organisms of the fish, (commonly the larvae forms of the aquatic insects) seem to be more sensitive to pollutants than are the fish. Nature has worked this out very neatly; if the fish food dies quickly, then there is little food for the fish, the fish will then search elsewhere for food and will then swim out of the high concentration of pollutant. There are of course many exceptions to this idea; some insects tolerate tremendous concentrations of deleterious materials,





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1 and some fish are attracted to lethal zones of high  
2 concentrations of certain pollutants.

3 Q Mr. Shaw, could I ask  
4 you to slow down a little bit again. The reporters  
5 are having trouble keeping up with you.

6 A I am sorry. Back to  
7 "nature has worked this out very neatly"?

8 Q I beg your pardon.

9 A Back to "nature has  
10 worked this out very neatly or do you want me to go  
11 back further than that?

12 Q No, I think they have  
13 got what you have said but if you can slow down from  
14 now on, they will be able to keep up more readily.

15 A Oh, I see, I was just  
16 worried about the time.

17 Q We have got lots of time  
18 so don't worry about that.

19 A Invertebrates in soil are  
20 also generally destroyed by salt concentrations similar  
21 to those mentioned above. The dispersed clay becomes  
22 both an air and water block and animals in the  
23 soil may suffocate when trapped in or under the solo-  
24 dized layer. Buried salt can migrate to the surface  
25 from pits or buried sites; brines which disappear have  
26 not necessarily evaporated and ceased to be a problem.

27 Plants die by what appears  
28 to be the direct action of salt. Some species of wheat  
29 and rye grasses can stand quite high concentrations.  
30 Experimental watering of trees showed that pine trees



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1 died when water containing 500 ppm of chloride (that is  
2 sodium chloride) was used as their only water source  
3 whereas white spruce managed to live when irrigated  
4 with 1,500 ppm of chloride (as sodium chloride). One  
5 of the wheat grasses appeared to tolerate 4,000 ppm of  
6 chloride. Some weed seeds will germinate even at 20,000  
7 ppm of chloride -- 25,000 ppm of chloride. Plants  
8 seem to be adversely affected by salt in several ways:  
9 one is directly due to salt interfering with osmotic  
10 transport causing destruction of various cells; and  
11 another is indirect and is linked to the buildup of  
12 toxic materials below the solodized layer. In the  
13 anaerobic conditions below this layer <sup>is a</sup> there ~~there~~ tendency for  
14 sulphate reducing bacteria (and these are Desulpho-  
15 vibrio desulphuricans) to thrive. These produce  
16 hydrogen sulphide, which is lethal to plants as well  
17 as to most animals as already noted.

18 Q Would you outline the  
19 problems that arise in connection with disposal of  
20 sump fluids?

21 A The process of drilling  
22 an oil or gas well customarily generates a considerable  
23 volume of waste water (three or four million gallons  
24 could be generated by a single deep well). This water,  
25 if liberated incautiously, can have an adverse impact  
26 upon the environment.

27 A sump is a catch-all  
28 for holding waste products, slop water, or  
29 temporarily storing materials prior to transfer to ano-  
30 ther point. Usually little attention is paid to its



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1 contents. In the oil well drilling industry, the drill-  
 2 ing fluid, the rig wash water, and often much of the  
 3 surface run-off water in the area of the rig, all drain  
 4 into a hole bulldozed into the lease area and fre-  
 5 quently banked with the fill dirt. This constitutes  
 6 the sump. The wash water may assume a large volume  
 7 due to the need of cleaning the drilling floor after  
 8 various operations have spilled mud on the floor.

9 Because the sump is  
 10 usually contaminated with drilling fluids, we should  
 11 first consider why drilling fluids are needed, what  
 12 they are made of, and what their properties are.

13 A drilling fluid is  
 14 needed to lubricate and cool the bit, and also to  
 15 return the cut rock to the surface. At the surface,  
 16 the cuttings are screened away from the drilling fluid  
 17 and the fluid is returned to its own pit. This pit acts  
 18 as a sump reservoir for the mud pump to recirculate  
 19 the fluid for more cuttings returns. The muddy cuttings  
 20 usually find their way into the sump as another waste  
 21 product, after small sacks of them are collected for  
 22 the geologist at various footages drilled. Water alone  
 23 (or even air) could be used to cool the bit and return  
 24 the cuttings,; the only apparent problem would seem  
 25 to be the obvious one of velocity. Therefore, it would  
 26 appear that if you used a big enough pump you could  
 27 clean any debris (cuttings or even iron) out of the  
 28 hole. This (like most sweeping statements) is a half  
 29 truth, and leaves you sometimes in desperate  
 30 circumstances. The use of water alone is quite common





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1 when drilling surface hole, but as you drill deeper,  
2 problems begin to arise. Certain formations may be  
3 sensitive to water (or air blown dust if air is  
4 used) and they may begin to absorb water (or dust).  
5 This can cause several problems -- stuck pipe because  
6 of mud rings, sliding or heaving shale, and stuck  
7 pipe when a worn out bit has to be retrieved and re-  
8 placed with a new bit (this is, act is called  
9 tripping). And there are comprehensive books on  
10 drilling fluids such as Rodgers, and/or on oil well  
11 drilling technology, such as McCray and Cole, and  
12 they should be examined if the reader wishes detailed  
13 explanations of these functions, and of the succeeding  
14 terminology.

15 In order to overcome these  
16 problems, bentonite (which is one of the clay-like  
17 minerals which is part of the bentonite) is added to  
18 the water to provide viscosity, yield strength, and a  
19 thin layer of an impervious but slippery coating on  
20 the inside of the drilled hole. This will prevent  
21 water penetrating the surrounding formation, which  
22 would cause sensitive formations to swell. That is, the  
23 water would cause the sensitive ones to swell. At  
24 the same time we reduce the possibility of being  
25 stuck on bottom by keeping the cuttings in suspension  
26 in the returning fluid. The drilling fluid may have to  
27 be modified at various times throughout the drilling  
28 operation in order to maintain wall-building properties  
29 and control viscosity, gels, and water loss. Therefore,  
30 various chemicals are added. These may be as simple as





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1 sodium bicarbonate to treat out drilled cement, or  
2 sometimes extremely complex; particularly if you have  
3 to deal with emulsifiers or partially emulsified oil,  
4 peculiar formations, various extenders, thickeners,  
5 antifoam agents, anticorrosion agents, thinners, and so  
6 forth. A recent count of <sup>the</sup> brand name additives on the  
7 market surpassed the 600 mark.

8 A deep well, besides pene-  
9 trating through several different rock formations, will  
10 often pass through soluble minerals such as salt,  
11 anhydrite, or phosphates. These affect the drilling  
12 fluid and must be adjusted for; portions of these  
13 soluble minerals also find their way into the  
14 waste sump. Deep hole muds often must be adjusted for  
15 high temperatures and pressure peculiarities, since some  
16 holes will be 18,000 feet deep and may take over a year  
17 to drill. The final sump then contains surface slops,  
18 rig-wash detergents, spilled diesel fuel, brine from  
19 packer tests of formations, sometimes crude oil, special  
20 dispersants, precipitants, acid from acid washes, frac  
21 fluid, emulsifying agents, humic acids, tannic acids,  
22 ligno-sulphonates, chemicals for drilling mineral beds,  
23 cement slurries, and salts, etc. The contents of the  
24 sump reflect the history of the entire drilling opera-  
25 tion from spudding to eventual production or abandonment.  
26 The volume of fluids in the sump is exponentially  
27 related to the depth of hole drilled, the problems  
28 encountered and the length of time it has taken to  
29 drill the hole. This volume may be in excess of 100,000  
30 barrels. Fortunately, this is a rare occurrence, but



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concerned regulatory bodies should keep this in mind.

Experimental work done at the Energy Resources Conservation Board Laboratory indicates that many of the chemicals used in drilling fluids are toxic to plants and animal life. Some are synergistic with other commonly used or frequently spilled compounds. Synergism is the ability possessed by certain pairs of compounds such that they mutually cooperate to produce an effect greater than the sum of the effects produced by each component alone. A few of the materials used in drilling fluids are either not toxic, or are only toxic in very high and seldom used concentrations. A very few inorganic salts appear to be anti-synergistic.

Q Could you tell us what is the nature of the materials used during the drilling process and can their interactions be determined?

A The determination of all of the synergistic and anti-synergistic effects of the millions of possible combinations that could be produced by mixing some of the more than 600 additives would be interesting but virtually impossible to produce. A number of the more important components and combinations of components have been tested in water using rainbow trout. Based on these tests the following generalizations seem to be justified:

a) some hydrocarbons such as crude oil produced from formation tests may not be lethal until the concentration is over 400 mg/l;

b) some detergents such as rig-wash compounds are



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1 not lethal until the concentration is over 200 mg/l;

2 c) many of the oil and detergent combinations  
3 that separately are lethal at fairly high concentrations  
4 are extremely lethal as mixtures when quite diluted;

5 d) stable suspensions of colloidal material  
6 (like the bentonite of the drilling mud) are lethal  
7 to fish, because they coat and suffocate. The clear  
8 fluid extracted from some bentonite suspensions of 10  
9 pounds/barrel of bentonite were not lethal to rainbow  
10 trout in 96 hours;

11 e) diesel fuel from fuel spills and machine  
12 clean-up depending upon the method of manufacture, may  
13 be very toxic;

14 f) the clear water extracted from a diatomaceous  
15 earth slurry as used in drilling muds is not toxic  
16 even when the slurry used is 5 pounds/ barrel, which is  
17 14,285 mg/l about;

18 g) a particular brand of reagent grade KCl was  
19 quite lethal at concentrations as low as 1 mg/l. This  
20 was unexpected since sodium salts are not toxic below  
21 20 mg/l. KCl is used in special drilling muds;

22 h) ammonium phosphate and ammonium sulphate which  
23 are used in drilling muds to inhibit clay swelling,  
24 are both toxic at the same low concentration. This  
25 should be expected since ammonia is dangerous to most  
26 animal life at quite low concentrations, ( that is,  
27 less than 100 mg/l mark).

28 i) many of the polyacrylamide bentonite flocculants  
29 or extenders used in drilling fluids are not toxic at  
30 low concentrations (below 100 mg/l). This is well





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1 within the effective range;

2 j) corrosion inhibitors from drilling muds or  
3 packer tests are generally very toxic (in the same  
4 toxicity class as the bacteriostats, which they resemble  
5 in structure);

6 k) soil sterilants and weed poisons used on the  
7 lease are often very toxic to animals, being in the  
8 less than 1 mg/l class;

9 l) some humic acid mud thinners are toxic at  
10 very low levels of concentration;

11 m) carboxymethylcellulose used in drilling muds  
12 as a viscosifier or water loss additive generally is not  
13 toxic until beyond the normal usage concentration  
14 (possibly because food grade additives, because food  
15 grades are marketed for use in drilling fluids);

16 n) tanning type mud thinners tend to be less  
17 toxic than other thinners (provided that they are  
18 tannins and not mixtures containing other materials);

19 o) food grade glycols and some of their polymers  
20 which could be used in special muds or as motor anti-  
21 freeze may be only very slightly toxic (20 pounds/  
22 barrel or 57,000 mg/l); you can read that as ppm if  
23 you wish; it is approximately correct;

24 p) some of the polyethyleneoxy types of detergents  
25 or dispersants usable in drilling fluids or as rig wash  
26 compounds are only slightly toxic. Some closely related  
27 compounds are quite toxic;

28 q) aluminum salts, trivalent metal salts, and  
29 alums which may be used to clarify sumps may produce  
30 a very toxic solution if the pH is not carefully con-



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1 trolled. The result is that the metal salt which would  
2 normally precipitate will remain in solution;

3 r) some lignosulphonate mud thinners are toxic  
4 at concentrations exceeding 100 mg/l;

5 s) some of the phosphoric acid ester dispersants  
6 which could be used in drilling fluids or for rig  
7 wash compounds, are toxic above the 10mg/l level;

8 t) rape seed oil which could be used to replace  
9 the more poisonous oils in drilling muds is nearly non-  
10 toxic provided that the edible variety -- that is, low  
11 in erucic acid -- is used, and that surface active  
12 agents or detergents are absent;

13 u) the clear water extracted from barium sulphate  
14 mud weighting material is not toxic;

15 v) powdered gilsonite used in oil emulsion  
16 muds is not toxic in concentrations below 0.33 pounds  
17 per barrel ( and that should read <sup>about</sup> 1,000 mg/l and not  
18 100 as it is in the text);

19 w) emulsion breakers used in muds seem to be very  
20 toxic, in the same class as some corrosion inhibitors  
21 and bacteriostats. Some may have similar structures;

22 x) sodium lauryl sulphonate used as a washing  
23 compound produces very toxic solutions at low concentra-  
24 tions.

25 Q Could you tell us, sir,  
26 what steps can be taken to alleviate the environmental  
27 problems associated with the disposal of drilling sump  
28 fluids?

29 A If tests have shown that  
30 <sup>used</sup> the fluid/at a particular well is toxic, one alternative



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1 is to dispose of the fluid to injection wells or dis-  
2 posal wells. Disposal to deep formation presumes that  
3 a disposal well is available which satisfies the fol-  
4 lowing conditions:

5 a) it is cased from surface to point of injection.

6 b) it is cased with materials that will not  
7 corrode;

8 c) that the casing when placed was set in place  
9 in such a way that either cement returns were obtained  
10 at surface or that every aquifer was squeezed with  
11 cement to ensure that even if the casing failed, there  
12 could be no contamination of the aquifer;

13 d) that the injection formation be a minimum  
14 depth below the surface of at least 4,000 feet;

15 e) that excessive injection pressures which  
16 could rupture the formation or the casing are never  
17 employed;

18 f) that the fluid injected be compatible with the  
19 natural connate brine such that no insoluble materials  
20 are produced when they mix during or subsequent to  
21 injection.

22 However, if the volume  
23 for disposal to the lease exceeds 650 barrels/acre  
24 (that is approximately an acre inch) then it can usually  
25 not be disposed of to the lease area in one application.  
26 In this case, the fluid should be treated with  
27 neutralizing agents, absorbents or oxidants which will  
28 remove the poisonous chemicals, and which, in them-  
29 selves are harmless or become harmless by the reaction).  
30 The effectiveness of the treatment should be





confirmed by re-testing the actual field treated sump fluid with live trout to ensure that it is non-toxic; then final disposal can be permitted. The treated fluid may then be disposed of on or off lease, care being taken to not dump the water into water-courses and streams and lakes; or to allow salty but non-poisonous water to inundate sensitive trees. If a sump is in an area which is undulating a very careful choice of area for disposal has to be made. It is important to ensure that:

- a) no fluids migrate away from the designated area;
- b) that application rate, weather, etc. are considered;
- c) relatively bare, flat, dry areas and meadows are used, as opposed to heavily forested steep slopes and boggy areas;
- d) no water course or active stream or lake is used as part of the disposal area;
- e) no valuable timber areas are used as disposal sites;
- f) gravel and sand pits are not used since fluids which absorb easily tend to migrate elsewhere.

If the water is detoxified and is of such a high volume that continuous disposal to a limited area will only generate a high volume of run-off water, it is necessary to consider devising an irrigation scheme. To do this it is necessary to obtain composite samples of soils from the cleared disposal area. These samples must then be delivered to a competent soils laboratory, together with





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1 a large volume of water from the sump in question.  
2 The soils specialist will then tell you how much of  
3 that kind of water can be spread on that soil, with  
4 fertilization or other treatment, provided that a  
5 grass or legume crop is properly established first, etc.

6 If the sump is  
7 generated in winter, it has been found possible and  
8 economical, through heating and circulating  
9 equipment to detoxify a dangerous sump. Generally,  
10 sumps which are lethal should be held for summertime  
11 treatment and disposal. Large volume disposal of sumps  
12 in wintertime tends to become part of the spring  
13 run-off and could create local toxicity problems.

14 Furthermore, the addition  
15 of irrigation water to frozen ground could cause  
16 freezing of the delivery lines and would not  
17 deliver the water to be absorbed into the soil where  
18 it is least likely to do any harm. In summation, I  
19 would recommend:

20 1) that methods of recycling waste fluids be  
21 developed such that the ideal situation of little or no  
22 waste water may eventually be approached;

23 2) that the toxicity of all the chemicals used  
24 in all industries be evaluated in relation to their  
25 effect on the environment;

26 3) that alternative chemicals be developed which  
27 are less toxic than those currently used;

28 4) that methods of detoxifying effluents be  
29 evaluated such that each situation can be effectively  
30 and cheaply dealt with;



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1           5) that samples of all effluents, whether they  
2 have been treated or otherwise, be finally checked for  
3 toxicity prior to disposal by using some species of  
4 live animal.

5           6) that research and development be encouraged  
6 by the surveillance arm of the government such that  
7 there is an incentive gain to research. This could  
8 be managed via tax relief, but should result in  
9 improved practices ( for example, reduction in volume  
10 of waste water and/or development of more effective,  
11 less toxic chemicals).

12                   Q     Are there any threats to  
13 humans, wildlife or plant life if a gas well blows out?

14                   A     Yes, there could be.

15                   Q     Would you outline some  
16 of these threats and indicate what precautions can be  
17 taken to minimize them?

18                   A     As previously mentioned  
19 hydrogen sulphide and mercaptans are generally  
20 poisonous. Aside from this, pure hydrocarbons when  
21 mixed with air can be inflammable or even explosive.

22                   THE COMMISSIONER: Excuse me,  
23 just stopping for a second           , Dr. Shaw, Mr. Shaw,  
24 the evidence of the producers has been that they have  
25 found no hydrogen sulphide, no hydrogen sulphide, H<sub>2</sub>S  
26 at all in the gas fields that they intend to utilize.  
27 It was in the evidence, wasn't it?

28                   MR. BAYLY: Yes, I think it  
29 goes farther than that, sir. They have said they have  
30 found no sulphur compounds.



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THE COMMISSIONER: Right.

Anyway, you said aside from this, pure hydrocarbons when mixed with air can be inflammable or even explosive. Carry on, Mr. Shaw, please.

A Finally, fluids are sometimes produced with natural gas which are slightly soluble in any water contacting them (as mentioned earlier) and these solutions can be dangerous. Plants can also suffer from contact with components of natural gas such as ethane or again hydrogen sulphide, as well as being adversely affected by contained materials such as salt. Fortunately, the threat to human beings is relatively small unless unusual circumstances are encountered such as:

1) extremely sour gas may fill a depression or hollow where people are or have to go, either deliberately or inadvertently;

2) very high pressure gas may escape from a ruptured flow line in the presence of people. Gas at a high pressure can cut like a knife.

It is possible that the remote chance of injury could be alleviated by ensuring:

1) that people be constrained to stay away from high-pressure flow lines either by a wide-ranging educational programme, warning signs or other such devices applicable to the situation;

2) that production lines, flow lines and well heads generally be routed away from low basins such that the chance of pockets of poisonous or inflammable





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1 gas being liberated is much reduced;

2 3) that well-heads be protected by reinforcements  
3 commensurate in strength with the class of impact poss-  
4 ible, for example extremely strong where shifting ice  
5 is involved, probably less strong for other factors.

6 Q Mr. Shaw, as a chemist,  
7 do you have concerns about possible adverse  
8 environmental effects of any other compounds, or  
9 groups of commercial chemicals, that can be used in the  
10 petroleum industry?

11 A Many materials used in  
12 the petroleum or any other industry can be dangerous  
13 particularly if misused. Special phosphate ester  
14 high-temperature lubricants (often used to lubricate  
15 compressors or their power sources), metallic soaps  
16 used in greases, red-lead pipe dope, additives used in  
17 gasoline, and other chemicals used in the drilling  
18 industry all are capable of creating problems.

19 Mixing detergents or  
20 dispersants with oils of any kind often produces  
21 synergistic results in toxicity. Fortunately sensible  
22 usage of these materials can be made as safe as the  
23 usage of fires for heating. Under control, wisely used,  
24 they can be great blessings to the user.

25 Q Can you tell us, Mr.  
26 Shaw, why has sulphur dioxide received so much attention  
27 by scientists and regulatory agencies in Alberta?

28 A Sulphur dioxide can  
29 be part of the air-carried dust generated by  
30 burning sulphur or hydrogen sulphide. If the air



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1 circulates in the open, the SO<sub>2</sub> can be so widely dis-  
2 persed that it will create no immediate problem.  
3 Concentrations of SO<sub>2</sub>, even at very low levels or  
4 concentrations are very irritating and can cause  
5 damage to plants and animals quite quickly. If SO<sub>2</sub>  
6 must be generated and released it is common practice  
7 to ensure that it is expelled from a considerable  
8 height (from tall stacks) to ensure rapid and  
9 extensive dilution with the surrounding atmosphere.

10 Q Gas discovered to date  
11 in the Mackenzie Delta region is sweet gas, as we  
12 understand from the evidence we have heard so far.  
13 Aside from the possibility of sour gas being found  
14 in other gas fields in this area in the future, in  
15 your opinion is it possible for a sweet gas field to  
16 turn to sour gas as the reservoir is depleted?

17 A I believe that this  
18 could occur since a bacterium (Desulphovibrio  
19 desulphuricans) --

20 Q I wonder if that could  
21 be spelled for the purpose of the record, Mr. Shaw.

22 A D-e-s-u-l-p-h-o-v-i-  
23 b-r-i-o -- Desulphovibrio and then desulphuricans --  
24 d-e-s-u-l-p-h-u-r-i-c-a-n-s -- is capable of living in  
25 oil reservoirs. It can strip the oxygen from the  
26 sulphate radicle and eventually generate hydrogen  
27 sulphide. Desulphovibrio sp. (that is various species)  
28 could enter a reservoir at the time a well was drilled,  
29 but probably the easier way for them to enter a  
30 reservoir is for them to be inadvertently pumped



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1 into the reservoir with the pressure maintenance water  
2 being pumped into the bottom of the reservoir in an  
3 attempt to improve the amount of oil eventually reco-  
4 vered from the reservoir. One should bear in mind  
5 that this pressure maintenance is usually not prac-  
6 ticed on gas pools.

7 Q Do you have knowledge  
8 of any adverse environmental effects resulting  
9 from sub-lethal concentrations of chemical compounds  
10 associated with the petroleum industry?

11 A Unfortunately, there is  
12 very little in the literature on the sub-lethal effects  
13 of: for example, chromium from the chromo ligno sul-  
14 fonate thinners; or potassium from the potash muds; or  
15 from the lignins; or lignites; or the hundreds of other  
16 additives. One should probably assume that, in a sensi-  
17 tive environment, there could be adverse effects in the  
18 ecosystem, but much research is needed to determine  
19 what these potential effects are, how they might be  
20 minimized, and which are the worst offenders to speci-  
21 fic plants and animals.

22 Q From your experience,  
23 are there ways that the bentonitic clays associated  
24 with drilling can be safely disposed of provided  
25 adequate steps are taken?

26 A Yes, quite commonly  
27 the clay component of drilling fluids can be caused  
28 to flocculate and coagulate. The resultant clobbered  
29 mud (if fairly dilute) will settle, leaving a clear  
30 supernatant fluid on top. The fluid so treated could





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1 also be more readily centrifuged or filtered clear of  
2 its suspended solids. The clear fluid could be tested  
3 for its toxicity, and either detoxified if toxic, or  
4 disposed of directly if non-toxic.

5 Q Do we know what effect a  
6 surface coating of bentonitic clay might have upon  
7 lichens?

8 A Only in a general sense  
9 of what I would expect, and that is that if light and  
10 air are shut off from a plant then it is probable that  
11 the plant will suffer. Specific effects would depend  
12 on the drilling mud and on the type of plants involved.  
13 I rather expect that a considerable amount of work  
14 needs to be done on this, but the professional botanists  
15 could better elucidate this need.

16 Q We often hear of burning  
17 as a clean-up technique for spilled oil. What happens  
18 to the soil surface when you burn off an oil spill?

19 A That depends on the  
20 season of the year, the amount of oil and on how  
21 wet the ground is. If the area is dry and it is summer-  
22 time any free oil should be collected and removed as  
23 soon as possible. Generally, the residues should not  
24 be burned since the act of burning tends to kill or  
25 disadvantage the plants that may be minimally effected  
26 by the oil itself. Burning also tends to reduce the  
27 number of bacteria in the soil by cooking them, and also  
28 tends to leave a waxy or asphaltic scum on the burn  
29 area. It appears then to be more difficult to get  
30 rehabilitation steps quickly started. When one has





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1 gained a lot of experience, I suspect that there are  
2 situations in winter where oil spills on thick unflawed  
3 ice might be advantageously burned to remove the  
4 residual oil.

5 Q Can you make any  
6 recommendations as to circumstances under which oil  
7 could be burned off and the circumstances under which  
8 burning would not be desirable , a desirable clean-up  
9 technique?

10 A Generally, I would con-  
11 sider burning as an aid to clean-up in winter, but  
12 would be very cautious in summer. I would also want to  
13 know more about the effect of oil spills on thawed  
14 and frozen tundra before I was entirely sure of the  
15 probably effects. If the botanists feel that the  
16 tundra is exceptionally sensitive I would be very  
17 cautious about burning.

18 Q A March 1975 Forestry  
19 Report, published by the Northern Forest Research  
20 Centre in Edmonton showed an aerial photograph of the  
21 Swan Hills oil field. And Mr. Commissioner, this was  
22 the one that I had entered as an exhibit earlier. In  
23 this particular area there is a very dense network of  
24 surface disturbances. Is this intensity of surface  
25 disturbances inevitable after one or two decades of  
26 petroleum development?

27 A Not necessarily. One  
28 should consider the Medicine Hat gas field where the  
29 wells are generally at least a mile apart. One should  
30 also consider whether the reservoir could be depleted



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1 satisfactorily from single locations from which many  
2 long-distance whip-stocked or directionally drilled  
3 holes emanated. However, this could be impractical,  
4 expensive, and dangerous. It might possibly be better  
5 to devise a pre-existent pattern of least roadways to  
6 cover the most territory with the least surface dis-  
7 turbance. Methods of road building, winter drilling  
8 programmes restricted to the Arctic night, and other  
9 procedures if properly investigated might minimize  
10 the environmental impact, not only on the present but  
11 in future activity.

12 Q In your opinion, is sur-  
13 face disturbance from oil and gas field development  
14 a significant contributor to siltation of streams and  
15 lakes in central and northern Alberta?

16 A It may be. I have heard  
17 that silt carried from the Swan Hills oil field via  
18 the Swan River has caused siltation in Lesser Slave  
19 Lake.

20 Q In Alberta, does conden-  
21 sate from gas lines ever escape into the environment  
22 and are there harmful environmental effects from the  
23 chemical makeup of this condensate?

24 A Yes, condensate does  
25 sometimes get spilled from various accidents, and yes  
26 the hydrocarbons mercaptans, and sulphur can be  
27 harmful. Fortunately, these are rare occurrences in  
28 Alberta.

29 MR. BAYLY: Mr. Commissioner,  
30 that is the extent of the evidence-in-chief of Mr.



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1 Shaw and he is available for cross-examination at this  
2 point.

3 MR. GOUDGE: Could we break...  
4 for lunch, sir?

5 THE COMMISSIONER: All right.  
6 We will adjourn until 2:00.

7 (PROCEEDINGS ADJOURNED TILL 2 P.M.)  
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(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

THE COMMISSIONER: We're ready for cross-examination of Mr. Shaw. Mr. Carter, do you have any questions?

MR. CARTER: No, sir.

THE COMMISSIONER: Mr. Lutes?

MR. LUTES: No, sir.

THE COMMISSIONER: Mr. Goudge?

CROSS-EXAMINATION BY MR. GOUDGE: Afraid so, sir.  
Mr. Shaw, you're an employee of the Energy Resources Conservation Board of Alberta, is that correct?

A Yes, that is correct.

Q Could you describe to me briefly what that agency is charged with doing?

A Energy conservation and all its aspects within the boundaries of the Province of Alberta.

Q Does the agency regulate hydrocarbon exploration, drilling and production?

A Generally speaking, yes.

Q And you're involved with it on the research side, or the enforcement side, or both?

A Mostly from the standpoint of determining what is being dealt with, on occasion. That is, I would provide analyses where analyses were required of various materials.

Q So I take it the agency as well, has a substantial regulatory side, enforcement



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1 side?

2 A Very correctly, yes.

3 Q And for that purpose,  
4 has inspectors and officers who would engage in the  
5 issuing of permits and the following up of permits?

6 A Yes.

7 Q Are you either involved  
8 in or familiar with that side of the operation?

9 A Usually not involved.  
10 Somewhat familiar.

11 Q Yes. Well, perhaps as  
12 I go along, I can ask you then, one or two questions  
13 based on your knowledge of that part of the operations.

14 A Surely, where knowledge  
15 is lacking I will indicate so.

16 Q Now, your evidence in chief,  
17 sir, at page seven, you speak at the bottom of one  
18 solution to the problems you spoke of being the  
19 development of minimally damaging materials.

20 A Yes.

21 Q Is that a solution that  
22 to your knowledge has been operative in the hydro-  
23 carbon industry in Alberta?

24 A I'm sorry, I don't quite  
25 understand that question. Is that a solution which  
26 has been offered?

27 THE COMMISSIONER:  
Has been used.

28 A Has been used?

29 Q Yes.

30 A This approach, I believe



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1 has been used by a number of companies. I haven't  
2 kept track of which companies in relation to what  
3 particular material.

4 MR. GOUDGE:

5 Q Yes, it's a selfinstigated  
6 procedure I take it, rather than a procedure required  
7 by the regulatory agency?

8 A No the regulatory agency  
9 wouldn't require an activity but, for example, you  
10 could be in a position or the company could be in a  
11 position where they wish to either use or dispose of  
12 a particular material and would find that it was ex-  
13 pensive to use this material because of concomitant  
14 problems associated with this and so they would tend  
15 to say "well it would less expensive to go to a more  
16 easily removed or controlled material", so they tend  
17 to, from simple economics, go to the -- and <sup>through</sup> of course  
18 certainly concern for the environment-go to better  
19 compounds.

20 Q Do you know whether the  
21 regulatory agency your board has ever in the past  
22 required development of a less toxic material?

23 A No, the board has never  
24 made such requirements to my knowledge.

25 Q Do you know why not?  
26 Is there any policy reason that you can speak to why  
27 they refrain from that course?

28 A That's usually a choice  
29 that  
30 it is felt/can be by and large left to the companies  
to make the sensible choice and by and large the  
companies do make the sensible choice, so as long as



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1 it works, this is what you -- you know -- hope will  
2 continue.

3 Q In theoretical or conceptual  
4 terms, though, this would be one tool that a regulatory  
5 agency has at its disposal?

6 A Why assuredly, I would  
7 assume so.

8 Q Now, sir, on page 13  
9 you begin your reference to sumps by saying near the  
10 top of the page that usually little attention is paid  
11 to the contents of sumps; by that I take it you mean  
12 little attention is paid both by the producing companies  
13 and by the regulating agencies?

14 A Well, one should probably  
15 state this particular statement in other terms because  
16 this particular statement might be somewhat misleading.  
17 The idea is that materials are dumped into the sump  
18 and, <sup>at</sup> the points they are dumped at the time they are  
19 dumped, has little attention paid to what is being  
20 dumped. This does not imply that there is not attention  
21 paid to the sump when it comes to the time of disposal.

22 Q Yes, sir. So really  
23 you're saying there, sir, as I understand you, that <sup>it's</sup> the  
24 companies that use the sumps aren't really as con-  
25 cerned as they might be with what goes into them?

26 A Oh, some of them are  
27 really very much concerned because it could cost a  
28 great deal of money to remove the deleterious <sup>materials</sup> / later  
29 on if they need to or are required to.

30 Q But you said there that





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1 they don't pay enough attention to what they're  
2 putting into the sumps?

3 A It's not that they don't  
4 pay enough attention. That really isn't the situation.  
5 They pay attention, but it's the feedback from eventual  
6 problems which have to be solved and which will cost  
7 money. So they pay attention and they learn to pay  
8 attention. This is the process of learning, and  
9 they are, of course, learning to pay attention and  
10 are improving procedures.

11 Q Then, at question thirteen  
12 which is on page eighteen of your prepared evidence.  
13 You deal in more detail with the disposal of drilling  
14 sump fluids. If you'll turn to that, sir. You list  
15 there seven -- six, I guess -- techniques for --  
16 or criteria for the development of the disposal well  
17 technique. Are those criteria presently in use in  
18 your province? In connection with disposal wells?

19 A Roughly speaking --  
20 well -- yes roughly speaking with regard to practices  
21 in the province.

22 Q So the criteria (a) to  
23 (f) there, we could all find in operation in Alberta  
24 today?

25 A In a general sense, yes.

26 Q And are those criteria  
27 that are required by your agency to be used in Alberta  
28 before/<sup>a</sup>hydrocarbon company can engage in disposal  
29 well drilling?

30 A Yes, there may be others



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1 also required. This doesn't preclude the probability  
2 that there are other requirements additional to these.

3 Q I take it though, these  
4 are the six you see as being necessary for environmental  
5 preservation?

6 A These six are assuredly  
7 important.

8 Q Yes. Do you know the  
9 mechanism through which these six are required by your  
10 agency? Is it through permit?

11 A Generally speaking, I  
12 believe that to be correct.

13 Q And do you know whether  
14 there has been experience with prosecutions as a  
15 result of failing to meet these criteria?

16 A I usually don't pay any  
17 attention to the prosecution end of it. This is  
18 carried by the enforcement side and I rarely have  
19 occasion to know what the results are.

20 Q Then, sir, these are  
21 criteria that relate to disposal wells for other  
22 than gas plants. Would you --

23 A Not necessarily.

24 Q Let me ask you whether  
25 you would establish any additional criteria or omit  
26 any of these six if you were dealing with disposal  
27 for gas plants?

28 A It would depend a great  
29 deal on the gas plant -- where it was located, the  
30 kind of formation that you were feeling concerned about



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1 disposing into. Its porosity, permeability, compatibility  
2 with the fluids present or not present, the formation,  
3 the kind of fluid that you're dealing with as a waste  
4 product or as a material to be eliminated or stored.

5 A  
6 I can't answer that question in full because it is  
7 far too broad.

8 Q The kinds of fluids you  
9 mix together in a disposal well of some crucial import-  
10 ance?

11 A Very much so.

12 Q Are there any absolute  
13 constraints on that? That is, are there any combinations  
14 that you simply cannot put into a disposal well?  
15 Take for example, liquids such as refrigerants, methanol,  
16 corrosion inhibitors, and so on. Could they be  
17 combined with liquid hydrocarbons in a disposal well?

18 A Well, they might, but  
19 one would have to look at the specific example and  
20 relate it to the kind of formation fluid that you are  
21 dealing with and the entire reservoir process. This  
22 is something that you'd need to -- or want to really  
23 discuss with the reservoir engineers. The reservoir  
24 that you're going to use for storage or is it a reservoir  
25 that you are also producing at the same time that you're  
26 placing fluid in and so on. There are many considera-  
27 tions that you have to take into account.

28 Q Yes. There are obviously  
29 many conditions that have to be taken into account in  
30 creating the disposal well, but are there any circum-  
stances where you -- you're seeking to dispose of





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1 certain kinds of fluids and the combination proposed  
2 is simply such that you cannot create a disposal well?  
3

4 A Assuredly, there are.

5 There are some that you wouldn't want to put down.  
6 Particularly corrosive fluids. You wouldn't want to  
7 put down probably dangerous fluids unless you had  
8 further assurances that certain requirements were met.  
9 You wouldn't want to put down material which would  
10 generate or precipitate when it hit the connate fluid.  
11 Such that you'd have to be working over your wells  
12 all the time or drilling new ones in order to be able  
13 to continue to dispose of fluids.

14 Q So a disposal well is not  
15 available to take anything you want to put in it?

16 A Heavens, no. You have  
17 to be very cautious what you do. It depends on the  
18 situation, of course.

19 Q Then sir, over the next  
20 page, you refer to six criteria that you say should  
21 be observed in disposal of sump fluids through treating  
22 and spreading as I understood you.

23 A I beg your pardon, could  
24 you give me the last part again?

25 Q If you look at the top  
26 of page nineteen, you recite six criteria that should  
27 be observed if sump fluids are to be disposed of through  
28 treating and spreading rather than injecting in a  
29 disposal well.

30 A Yes.

Q Once again, are those



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1 criteria presently in practice in Alberta?

2 A Generally speaking we  
3 try to follow them, yes.

4 Q And would those criteria  
5 again be the subject of permits issued by your agency?

6 A They usually don't go to  
7 the case of issuing permits. They may require that  
8 it may be written on the license even of the particular  
9 well, particularly in critical areas that they strive  
10 to follow our interim directive.

11 Q I'm sorry, I didn't  
12 hear the last sentence.

13 A Try to follow our interim  
14 directive in such a way that they meet the criteria  
15 of the disposal of the sump fluids to surface, either  
16 treatment if they are to go off-lease, or proper  
17 burial and so on if they are to remain on-lease  
18 provided that the people who are in the regulatory  
19 agency are assured that there is no possibility of  
20 these materials migrating from the lease.

21 Q That assurance, though,  
22 comes through an agency device such as the license  
23 in the first place, or a permit?

24 A It can appear on the  
25 license; it doesn't necessarily. The operator will  
26 often be reminded by the field office in his area  
27 that particular well is drilled and they will receive  
28 a letter very commonly from that field office  
29 saying "please ensure that you follow the directives".  
30

Q Yes, now dealing with



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1 both the criteria for disposal wells and the  
2 criteria for disposal through treatment and dispersement  
3 that you recite in question thirteen, do you view  
4 those two sets of criteria as being applicable to the  
5 north?

6 A Well, that's quite a  
7 difficult question because I'm not totally conversant  
8 with the Arctic situation and I would suggest that  
9 one might consider some of these points as being  
10 guidelines in relation to an activity under and  
11 Arctic situation. But any of these points might  
12 be modified and perhaps even tightened down under  
13 certain circumstance because, I am told, and I am  
14 informed by reasonably authoritative people,  
15 knowledgeable people, that the Arctic situation is a  
16 very finely balanced system.

17 Q And I take it as between  
18 the two types of disposing of sump wastes that might --  
19 the qualification you just recited might apply rather  
20 more to disposal through treating and spreading than  
21 to disposal through disposal wells?

22 A Well, again, a difficult  
23 question, because one would have to look at the  
24 reservoir characteristics where you are intending to put  
25 the materials and there are a lot of provisos that  
26 enter in at this point. Contrarily, you are dealing  
27 with a very critical environment, so one would require,  
28 I think, a fair amount of study and examination to be  
29 sure of one's territory.

30 Q Then, sir, on page 20 of





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1 your prepared evidence, you deal with blowouts. I'm  
2 interested to know whether your agency would have  
3 any statistics that might be of interest to us as  
4 to their experience with blowouts. For example, is  
5 there any record kept of number of blowouts per certain  
6 number of wells drilled?

7 A Well, the term "blowouts"  
8 isn't quite the one I would use. I <sup>would</sup> suggest that one  
9 should think in terms of spills and perhaps lump the  
10 spills altogether. If we did this and looked at say,  
11 last year, for example, one would consider for example,  
12 something in the region of sixty thousand barrels of  
13 oil and salt water having been spilled, if you totalled  
14 up all of the spills in the province. Contrast this  
15 to the amount of oil produced in the province which  
16 is something between 400 million and 500 million barrels,  
17 and you have a very small per centage of the total  
18 production appearing as a spill. This answers your  
19 question.

20 Q It does as to spills.  
21 I wonder whether there are any statistics that deal  
22 with blowouts?

23 A Oh, assuredly. Your --  
24 they're all documented of course, both blowouts from,  
25 I assume that by "blowouts" you means the  
26 wellhead eruptions as opposed to -- or you see, you  
27 could have a wellhead eruption from a defective well-  
28 head which is complete and set up to operate as opposed  
29 to an escape of gas or hydrocarbon or such other  
30 deep formation of fluids, during the process of





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drilling. That, most correctly is termed a blowout. One doesn't usually think of a broken wellhead as a blowout but that could, of course, occur. We had one case where a grader operator ran into a wellhead and broke it off. These are all documented.

Q They would be documented --

A Assuredly.

Q -- or documentable in terms of number of blowouts per certain number of wells drilled, for example?

A Oh, yes, certainly, any way you'd want.

Q While you may not have those statistics at your fingertips, do you have any recollection as to whether those statistics indicate a reducing tendency to blowouts?

A Yes. I still object to the term "blowout". If you're --

Q Let me tell you why I'm posing the question, Mr. Shaw. We were told by the industry that technology is advancing quickly and that a consequence of that is that blowouts are becoming less likely. I wonder whether there are any statistics that you have knowledge of relating to Alberta that would support that?

A I don't know whether the statistics would tend to support that or not. That would depend on which end of the statistics you looked at. If you looked at the very new applications, there is much less tendency for blowouts than in the old



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1 material that is either being overpressured or has  
2 had a chance to corrode, etc. It depends on the  
3 money spent and the quality of equipment used.  
4 Equipment does exist which is probably better than  
5 previous equipment but it depends so much on how  
6 it is used and by whom.

7 Q But if I looked at wells  
8 that are newly drilled with new equipment, you think  
9 I would tend to find a lesser occurrence of blowouts  
10 than I would have found had I made the same analysis  
11 five years ago?

12 A If you expanded that to  
13 ten, I'd tend to agree with you, but this is also  
14 part of the regulatory agency's requirements. I  
15 wouldn't just say it was simply a case of there being  
16 particularly good equipment. It may that the regulatory  
17 agencies are requiring that better equipment be used.  
18 So it's a -- the two work hand in hand to achieve  
19 what you are suggesting.

20 Q But you've no doubt that  
21 it is being achieved?

22 A I'd like to see some  
23 statistics.

24 Q Now, on page 21, sir,  
25 of your prepared evidence, you refer to three factors  
26 that you say might reduce the chance of injury through  
27 blowouts. Are those three factors the kinds of things  
28 that you would see subject to regulation by an enforcing  
29 agency?

30 A This is a fair statement.



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1 I don't see anything wrong with your statement. There  
2 might be. As a generalization, this is a fair state-  
3 ment.

4 Q So that when you see --  
5 when you say that these three conditions ought to be  
6 ensured, you mean by that they've become the subjects  
7 of regulation by a regulatory agency?

8 A Well, they could become  
9 subject to the regulatory agencies. They could be  
10 something which is followed by the companies. The  
11 ideals of any circumstance is self-governing of the  
12 industry. I don't think that government or a regulative  
13 body has to interfere unless you've come across rather  
14 rough violations of what you might term good common  
15 sense.

16 Q Does your agency engage  
17 in regulations along the lines indicated by these  
18 three criteria?

19 A Within reason, yes.

20 Q How is it done, do you  
21 know? By permit, or --

22 A Sometimes by permit  
23 sometimes by direct requirements. For example, at  
24 wells which are productive of a high -- have a high  
25 content of hydrogen sulphide, there must be warning  
26 signs even during the drilling program, to take one  
27 example.

28 Q And, sir, question eighteen  
29 of your evidence on page 22 addresses itself to sweet  
30 gas possibly turning sour due to the introduction of





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1 bacteria. Just so I'll understand it, I take it you  
2 refer there to gas that is mixed with oil, since it  
3 appears to the oil and the bacteria that cause the  
4 problem?

5 A No, this is not necessarily  
6 the case. You could have a gas pool with a water  
7 or an aquifer -- a section of water underneath the  
8 gas pool or down. If that water contains a sulphate  
9 ion, the desulphovibrio are quite happy in such an  
10 environment and can generate hydrogen sulphide from  
11 that water. Minor amounts of hydrocarbon -- the  
12 fact that you have got increased pressure, the fact  
13 that you have got, probably, increased temperature,  
14 would provide a very convenient and likable spot for  
15 them to multiply in and generate hydrogen sulphide.

16 Q I take it then, you're  
17 saying that the occurrence you describe in that answer  
18 is applicable to a gas reservoir that is only gas,  
19 if there's water associated, there's water beneath  
20 the gas?

21 A Yes. I can't think of an  
22 instance where you have only water produced from a  
23 reservoir, but yes, you could have reservoirs that  
24 were dry of water; or reservoirs which were oil  
25 reservoirs that only contained oil and had no water  
26 in them. But this would be exceedingly rare. Even  
27 the field for example, it is -- in Alberta, it is  
28 considered to be free of water, and it does carry some  
29 water in the cardium sand.

30 Q Moving to question 20, sir,



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1       you address yourself to bentonitic clays -- I have  
2       as much trouble with that word as Mr. Bayly.

3                   A       Bentonitic, yes.

4                   Q       And you say that that  
5       clobbering mud is one way of reducing the impact.  
6       Is this -- is that technique that you described in  
7       actual use in Alberta?

8                   A       Most assuredly.

9                   Q       And again, I take it, it  
10      would be a matter of regulation. That is, is it a  
11      technique that's required to be used?

12                  A       Well, you could cause  
13      precipitation and coagulation of the drilling fluid  
14      such that you end -- could produce a clear fluid which  
15      you could then detoxify as necessary and if necessary  
16      and this is quite often done and is a reasonably common  
17      practice. The technique is not unique and it is not  
18      new and it is not theory;       it is actually in practice.

19                  Q       But it's a technique  
20      that is required by your agency?

21                  A       Yes. Where the fluids  
22      are going to go off-lease or they're particularly  
23      toxic or this sort of thing, yes. You want to get  
24      rid of the bentonite.

25                  Q       Well, sir, you spoke a  
26      moment ago about spills of concentrates and I take  
27      it from your answer to that question that you indicated  
28      there are statistics available that show, for example,  
29      spills of raw products in Alberta per year.

30                  A       Yes



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Q -- related to total production from the hydrocarbon industry per year?

A Yes.

Q Would you have any opinion as to whether the kind of percentage that you get from that comparison is transferrable north of the 60th parallel or not?

A That's a toughie because one would need to know a great deal about pipelining and the stresses applied to pipelines in order to be able to answer that question and I could not presume to be that conversant with the stresses that are likely to be put on pipelines and other production equipment. If we just assume, for the moment, that the material from which the pipelines and tanks and so on, are made, <sup>are</sup> roughly comparable to Alberta and there are no greater stresses than in Alberta, then you're looking at something in the region of 60 thousand to 100 thousand barrels of salt and crude oil -- salt water and crude oil per 400, 500, 800,000 -- 800 million barrels of product and salt water produced. So whatever percentage that works out to, I haven't worked it out.

Q You're not prepared, though to make that comparison given the difference. --

A Well, it is rather speculative since we even don't know what the -- what the production rate is in this environment so --

Q So any extrapolation to the north is very difficult?

A Yes, if you took the same



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figure you'd certainly probably be erring on the conservative side, I would suggest, but then that's-- you know you're dealing with very difficult conditions. You're dealing with shifting ice. You're dealing with a lot of conditions that make things more difficult here.

Q Now, one last question, Mr. Shaw. I'm interested in knowing whether it's possible to determine from statistics or from an analysis of the contents of a raw gas stream, the quantity of recoverable liquid that is available?

A Well, certainly, this is why the analyses are run in first place. To give you an idea of, you know -- just what you can do with it, just what its characteristics are and how valuable it is.

Q We were shown by, I think all the producers, but I have Imperial's example before me, a table that I take to be a table showing the breakdown of components of the raw gas stream that Imperial proposes to put through its Taglu processing plant. I wonder if you might have a look at that. Have you got it there, sir? It's a green cover.

A OK. Yes. Thank You.

Q It's table one, just at the back of the document.

A Yes. All right.

Q And you'll see the table contains a long list of components. Looking at that table and the quantities on the righthand side, is it





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1 possible for you to say what quantity of recoverable  
2 liquid will result from that?

3 A Roughly speaking, yes.  
4 What you could roughly expect. Do you wish me to give  
5 an idea of the formation?

6 Q Yes, if you would please,  
7 using those statistics.

8 A Well, by this table, be-  
9 ginning at hexane which is shown as .05 per cent and  
10 on down through heptane, octane, nonane, decane, unde-  
11 cane, dodecane, benzene, toluene, xylylene, aromatic A --  
12 and I'm not quite sure what is meant by that -- then  
13 cyclohexane and naphthene A, if we add all these  
14 together, we come to 1.44 per cent, unless I've made  
15 an error in my addition. Say roughly, 1.5 per cent  
16 and this, if applied and you took this 1.5 per cent  
17 and you converted it into actual liquid, it comes to,  
18 I think, something like 20,000 barrels per day of  
19 recoverable fluid.

20 Q And how would that 1.5  
21 per cent compare with the kind of run that comes from  
22 a gas well in Alberta? Is 1.5 per cent high or low or  
23 average?

24 A Well, there isn't such a  
25 thing as high, low or average. You'd get some that  
26 were a great deal drier than this and you'd get a few  
27 that were wetter than this as had -- were richer in  
28 hydrocarbon, but you'd find gases that would match these.  
29 I don't know about the specific components when you  
30 come to the quantity of cyclohexane. I'd be somewhat --



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it'd would be somewhat difficult perhaps to find an exact gas that would show the very similar concentrations of each component.

Q Quantities, I take it, of -- that are recited -- to take the Imperial example, you say it might approximate 20 thousand barrels per day?

A Yes.

Q Yes. And of that would there be a certain proportion that was commercial, if you like?

A I'd expect a pretty fair proportion of it to probably be convertible into straight<sup>run</sup>/gasoline. And cracker stock, etc.

Q I'm Sorry.

A And cracker stock, etc. It'd depend upon the complexity of the refinery operation. In other words, if you wish -- if the question is could you refine this into a usable product relatively easily, I would say probably, yes. But one would have to look at design parameters, etc. and get some refinery experts to answer that question.

MR. GOUDGE: Thank you sir. Those are all the questions I have.

THE COMMISSIONER: Any re-examination, Mr. Bayly?

MR. BAYLY: No sir, I have no re-examination.

THE COMMISSIONER: Well, thank you very much Mr. Shaw. I appreciate your coming and I



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1 understand very clearly that you've appeared as a  
2 private citizen and not as a representative or expressing  
3 the views of the Energy Conservation Board of Alberta.  
4 I quite understand that and there can be no misunder-  
5 standing on the subject. So thank you very much sir.

6 MR. GOUDGE: I propose sir that  
7 I know there's a community hearing tonight and I wonder  
8 whether we might press on and take Mr. Pimlott's  
9 evidence in chief and if you're content to do that sir,  
10 I wonder if we might break now.

11 THE COMMISSIONER: Just a break  
12 now?

13 MR. GOUDGE: Yes.

14 THE COMMISSIONER: All right.  
15 I'll buy that.

(WITNESS ASIDE)

16 (LETTER FROM HORSFIELD TO K.P. SAM,  
17 DECEMBER 20, 1974 MARKED EXHIBIT 438)

18 (QUALIFICATIONS & EVIDENCE OF J.M. SHEARER MARKED  
19 EXHIBIT 439)

20 (QUALIFICATIONS & EVIDENCE OF D.R. SHAW MARKED  
21 EXHIBIT 440)

22 (PROCEEDINGS ADJOURNED FOR A FEW MINUTES)

23 (PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

24 THE COMMISSIONER: Order,  
25 ladies and gentlemen. Mr. Ballem.

26 DOUGLAS PIMLOTT, sworn:

27 DIRECT EXAMINATION BY MR. BAYLY:

28 MR. BAYLY: Mr. Pimlott, I  
29 wonder if you could turn to the back of your evidence





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and read your curriculum vitae in to the record, please.

A If you don't mind, Mr. Bayly, I think I'd like to paraphrase it. I think I can do it just as effectively and I find rather some constraints on reading these things.

Q All right.

A In any case I'd like to -- I think perhaps I can summarize it. My university work was at the University of New Brunswick, and I have a Bachelor of Science in Forestry and my graduate degree is at the University of Wisconsin in Wildlife Management in Masters level and a PhD in Zoology. In terms of my career, I have worked in Government agencies for approximately fourteen years: Two with the Federal Government, seven with the Newfoundland Government and four with the Government of Ontario. I've been primarily involved in wildlife ecology and management for a period of almost twenty years, extending from about 1950 to 1970. The research in -- most of it which was involved with large mammals was continued after I went to the University of Wisconsin and extended up until almost the end of the decade. I think that part of my career in ecological research is probably now being terminated.

In the years that I was in government, I became rather involved in and concerned about the processes by which people are informed and one of the reasons for leaving government in the early 1960's was because I developed a rather strong feeling that I wanted to be involved in the milieu of society and I sometimes phrased it as saying that I wanted to



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1 be in a position where I could speak out loud and I  
2 found the university a very fine environment and it's  
3 provided me with an opportunity to be involved in  
4 society in a way that wasn't possible with govern-  
5 ment. I never regretted the years in government. I  
6 felt that they were very fruitful and I learned a great  
7 deal and -- but simply came to the point where I felt  
8 that for my personality it was no longer a tenable  
9 position.

10 On leaving university I began  
11 to become involved actively with conservation and en-  
12 vironmental organizations and because I had some pro-  
13 fessional skills, I began to conduct environmental  
14 investigations of one kind or another for them and  
15 these involved for a number of years, questions that  
16 related to parks and wilderness in Ontario and I  
17 represented the Canadian Audubon, (now the Canadian  
18 Nature Federation) on a number of issues associated with  
19 threatened or endangered species.

20 I, for instance, went to the  
21 seal hunt in the Gulf of St. Lawrence for a number  
22 of years and did a lot of interpretive writing of both  
23 the science and the actual things that were associated  
24 with the seal hunt. I played a similar role in both  
25 writing and investigating the question pertaining to  
26 wolves, which were also an animal that I studied  
27 professionally, but I played a fairly active role on  
28 the international scene -- the national and international  
29 scene in trying to bring perspective on the place of  
30 wolves in the biosphere. It was the study of wolves



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and their pray that took me first to the Arctic in 1966.  
The work was focused at the Dew Line -- from a Dew Line  
or an abandon Dew Line station in central Baffin Island.  
I received some inclination of what development in the  
north might mean as a result of those experiences  
because when these stations were abandon, some of the  
were left in -- the areas were left in a very sad  
state and that was one of the first things that began  
to give me some perspective on Arctic questions and  
began to cause my thought processes to work in a way  
that eventually resulted in some involvement.

The work that I did with the  
Science Council in 1969 and '70 were rather sort of  
the culmination of that because I had an opportunity  
as a leader of one of the Science Council's background  
studies to roam all over the country investigating and  
talking to people on the areas of the application of  
science in fisheries and wildlife management and  
research in Canada. I gained rather a sharpened focus  
on questions of the northern ecology and environment  
at that time. It was a direct result of those two  
events that made me rather an acute Arctic watcher in  
the latter part of the '60's and it was in the early  
days of the things pertaining to pipeline -- proposals  
for pipeline development that I became involved and  
was one of the founding members of the Canadian Arctic  
Resources Committee. That experience helped me to  
gain much more insight onto the problems of the native  
people in northern Canada faced and I was very pleased  
when it worked out that I could be a resource worker





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with the Committee for the Original People's Entitlement (COPE) in 1973. It was -- I think it is in this area something to gain insight on environmental problems and it is ~~in attempting to~~ portray that insight to the public that a fair amount of my career in the future will be devoted. I think that is probably the salient point that I would like to bring to the Commission's attention.

Q Dr. Pimlott, I understand we're then to start your evidence on page two with the question at the bottom of the page. What insight can you provide on the extent of scientific knowledge of Arctic marine environment and the scope of ecological research?

A During 1969, as I stated, I was involved in a background study of fisheries and wildlife in Canada for the Science Council. Our investigations showed that exploration for and development of energy and mineral resources in the Northwest Territories and Yukon was far ahead of <sup>the</sup> knowledge of the components of and the interactions within Arctic ecosystems. The imbalance was so pronounced that we recommended that an intensive program of research related to the various aspects of oil and mineral developments needed to be undertaken immediately.

It became very clear to us that the research that was being conducted by members of the Arctic Biological Station of the Fisheries Research Board of Canada which is now incorporated into Environment Canada, on marine environments in the Arctic was minuscule in terms of the knowledge that was





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needed as background to petroleum exploration and development programs which would eventually be undertaken in offshore areas. Three years later in 1972 when Canadian Arctic Resources Committee, which I'll refer to as CARC in any future references, held its first workshop and a report by a marine ecologist indicated that nothing significant had been done to improve the situation in the interim even though Imperial Oil was about to submit an application to construct its first artificial island in the Beaufort Sea for the purpose of drilling, and Department of Indian and Northern Affairs was moving to request cabinet approval for drilling in deepwater areas of the sea. To sum up, during the 1960's and the early 1970's when the stage was being set for intensive petroleum developments in offshore areas, very little was done to gain the knowledge which would be needed to assess the impact of development on environment or on animals such as seals, whales, birds and fish, which are so important to the way of life of the native people of the Mackenzie Delta.

Q Dr. Pimlott, what is your opinion regarding the proper relationships between research and development?

A Well, I came to feel in that that in the last half of the 1960's direct relationships should have been drawn between offshore oil and gas developments, potential environmental problems and the need for ecological research. In 1969 the relationship was well enough understood that a special conference on Arctic ecology and conservation was held at Edmonton



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under the sponsorship of the International Union for the Conservation of Nature and Natural Resources. About the same time, the Honorable Jean Cretien, then Minister of Indian Affairs and Northern Development, as the department was called at that time, gave a speech to a national organization pledging that Arctic ecosystems would be protected.

Q Specifically, how did you become involved in an investigation of offshore drilling?

A In September, 1973, I joined COPE at Inuvik as a resource worker. Soon after, I was invited to attend an environmental conference sponsored by the Arctic Petroleum Operators Association. It was held in Yellowknife in October 1973. In the written testimony, that's listed as -- a typographical error -- as 1974. At the conference, I overheard the discussion which alerted me to the fact that wildcat, or exploratory drilling in deepwater areas of the Beaufort Sea was due to start in 1975. In spite of my associations with the Science Council and with CARC, I was unaware that drilling was due to start so soon. When I reported this to Sam Raddi, President of COPE, he too was very surprised, and realizing the potential significance of offshore operations to the native communities which COPE represented, he asked me to conduct an immediate investigation for COPE. I agreed and worked on it as one of a number of activities from late October, 1973 till January, 1974, when I submitted my report. Early in February of 1974, the report was reviewed at a meeting of COPE's Board of Directors



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at Paulatuk and subsequently COPE issued a news release and made the report public. Both documents are available as an appendix to my testimony.

(QUALIFICATIONS & EVIDENCE OF D.R. PIMLOTT  
MARKED EXHIBIT 441)

Q How would you describe your work on offshore drilling?

A Well, I think that the COPE report would be perhaps most appropriately described as investigative journalism. I think that the approach I used was similar to that used by reporters who are assigned to investigate topics or issues for which little information is available to the public and I want to make it clear that I make no apology for that category. Part of my conviction that I developed when I was in government was that this was one of the areas where there were great lacks and great needs in Canada for people who would do this kind of investigation and provide incisive insights on areas on which information is almost invariably cloaked and unavailable to the public.

My later work was a more detailed study of offshore drilling in the Canadian Arctic which generally involved documentation of all sources of information. It was more sophisticated and involved the methodology and the approaches used by both journalists and political scientists in investigating and reporting on complex environmental and socio-political questions. I have considerable practical experience in investigating and reporting on topics





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1 of this nature and I have also learned a great deal about  
2 how to draw on areas of knowledge and expertise for  
3 which I have no formal education. The results of the  
4 comprehensive investigation on offshore drilling in the  
5 Canadian Arctic is to be published next week in a book  
6 by the Canadian Arctic Resources Committee which is  
7 called "Oil Under the Ice" and it could be made  
8 available as a supplementary document. Indeed it is  
9 listed as being in press as a supplementary document  
10 for the Commission.

11 Q Mr. Commissioner, we will  
12 make a copy of that available to the Inquiry in case  
13 people want to look at that. Dr. Pimlott, earlier you  
14 stated that you were unaware that wide-scale offshore  
15 drilling operations were imminent when you joined COPE.  
16 Could you explain?

17 A I had already been involved  
18 with CARC for more than two years and had been taking  
19 an active interest in Arctic affairs for some years  
20 before that. It appeared that both government and the  
21 petroleum industry had been keeping plans for offshore  
22 drilling a secret. I believe that the intention was to  
23 advance offshore operations to a fait accompli situation  
24 before the public and particularly native people and en-  
25 vironmental organizations became aware of what was  
26 happening and what would be involved. At any rate, the  
27 approach was effective in keeping information on plans  
28 for offshore drilling from coming to public attention.  
29 This effectiveness was attested by the fact that Wally  
30 Firth, who is a Member of Parliament for the Northwest



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Territories, heard first about the plans for operation in deepwater areas from the COPE news release and the report that I prepared for COPE.

Q What evidence do you have to support your statement that the intention was to advance operations to a fait accompli situation before information reached the public?

A In December, 1972, the Department of Indian Affairs and Northern Development convened the Northern Canada Offshore Drilling meeting. It was attended by members of a number of government departments, by representatives of petroleum companies which had holdings in the Beaufort Sea area, and by some engineering companies which serve them. It was closed to the press and to the public generally. When I began the investigation for COPE almost a year later, I learned about the conference but was refused access to the proceedings. The excuse given was that they contained proprietary information that was protected by agreements between government and industry. And the second thing was that on July 31, 1973 the Federal Cabinet considered the question of offshore drilling in the Beaufort Sea and gave approval in principal to it. However, no information on the decision was made public until after the release of the COPE report in February, 1974.

And, thirdly, although the desirability of informing native about plans for offshore drilling was discussed at the Northern Canada Offshore Drilling meeting, by Mr. Digby Hunt and Mr.



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Barry Yates of DINA, nothing was done until an off-shore issue of Dialogue North was published approximately eighteen months later. By then, they had already been informed about it by COPE and by an article in Inuit Monthly. And the papers that I refer to by Mr. Hunt and Mr. Yates -- Mr. Hunt gave the welcoming address and opening remarks in which he referred<sup>to</sup>/at the Northern Canada Offshore Drilling meeting and Mr. Yates gave the paper that was entitled "Industry - Government Co-ordination with Northern Communities". I say again this was in December, 1972 and we didn't begin our investigation until almost a year later.

Then, the fourth thing I think was indicated by the -- by Panarctic -- the work at Panarctic, in the winter of 1973-74, Panarctic drilled its first offshore well from reinforced ice in Hecla and Gripper Bay north of Melville Island. No information was made available to the public on the operation until the final stages when some reporters visited the site.

And fifth, there was the approval in principle which was given to Norlands Petroleum to drill a well in Lancaster Sound in 2500 feet of water. But no information became available to the public until it was reported in an issue of Northern Perspectives from information obtained from confidential government documents.

And the sixth, the drilling from the first artificial island in the Beaufort Sea established a precedent since it marked the transition





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1 from land to marine operations in the search for oil  
2 and gas in the Arctic. However, it was treated very  
3 casually by government and industry. Instead of being  
4 licensed under the Arctic Waters Pollution Prevention  
5 Act, it was dealt with under the Land Use regulations  
6 of the Territorial Lands Act. Approval for the applica-  
7 tion was sought only from the Tuktoyaktuk Hamlet  
8 Council although it dealt with a matter which was of  
9 concern to several other communities, and no public  
10 statement or news release about the event were made by  
11 either government or industry and the land use applica-  
12 tion which was in fact a very complex one, had to be  
13 processed by all organizations concerned within the thirty  
14 day period which is specific in the land use regulations.

15 Q What action did you take  
16 to obtain information on offshore drilling from  
17 government and the petroleum industry?

18 A In the initial stages of  
19 the investigation, I made a verbal request for in-  
20 formation, and particularly for the proceedings of the  
21 Northern Canada Offshore Drilling meeting and I  
22 requested this of the regional director DIAND at  
23 Yellowknife and this was at the time Mr. C. B. Armstrong.  
24 On November 1, of the same year, '73, I wrote Mr.  
25 Cretien and requested copies of all information which  
26 had been made public on offshore drilling. I received  
27 a reply to that letter on January 29, 1974 and he  
28 advised that no information had been released. I have  
29 copies of this correspondence between Mr. Cretien and  
30 myself available. In early December, following further





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specific requests for informations, DIAND made available copies of papers given by members of government at the Northern Canada Offshore Drilling meeting. The Department would not, however, provide copies of the papers given by members of industry, or the transcripts of the discussion which ensued.

Similarly, I wrote Imperial Oil and Panaractic Oil, the latter on two different occasions. Imperial Oil sent me a copy of an article on the construction of Immerk, which had appeared in an engineering journal, but no other information. I also made a verbal request of Mr. Murray Morrison of DIAND, for the opportunity to review the documentation provided the Land Use Advisory Committee by Imperial Oil on the construction and drilling proposals for Immerk. Mr. Morrison, who was chairman -- or I believe was chairman of the Land Use Advisory Committee at the time -- said he would look into the matter and advise me about it. However, I did not hear further from him about it.

In the case of Panarctic Oils, I first wrote Mr. H. J. Strain, the vice-president. He replied by referring me to Mr. Hetherington, president of the company. Later, I wrote to Mr. Hetherington for information on research conducted by the company but did not receive a reply from him.

Finally, I wrote to Environment Canada<sup>and</sup> subsequently in mid-December, met with three members of the Department. My objective was to determine if any information had been made publicly available, and to learn if the Department could provide any information



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on offshore drilling, or on the research program on the Beaufort Sea which by then was being planned. I was advised that no information had been released by the Department. In early February, shortly after the COPE report had been submitted, I received a preliminary outline of the research program for the Beaufort Sea Project. And the letter had been sent to CARC, was dated January -- in Ottawa -- was dated January 18 and I didn't receive it, however, until after the actual report had been written and submitted and released.

When it became clear that no information would be made available on offshore drilling from official sources, I made a deliberate attempt to obtain classified information from unofficial sources. Dougald Brown, who was working with CARC at Ottawa, assisted me. They report to COPE on offshore drilling was substantially based on classified information obtained in this way. Information obtained in a similar way and of a confidential nature was an important component of subsequent publications on offshore drilling and in fact, is also an important component of the "Oil Under the Ice."

Q Dr. Pimlott, you attended a conference on the Beaufort Sea in January, 1974. Will you describe it and state what you learned from it that was relevant to the COPE investigation?

A The Beaufort Sea Symposium was held in San Francisco in January, 1974. It was sponsored by the Arctic Institute of North America. It



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was a multidisciplinary gathering, the first major one where scientists came together to present papers on research conducted on the Beaufort Sea ecosystem. I attended it because I thought that it would be an opportunity to gain more understanding on how well prepared we were, in terms of scientific knowledge, to cope with offshore drilling activities in the sea. The symposium had obviously been stimulated by the imminence of offshore operations<sup>be</sup> cause it had received financial assistance from the petroleum industry and a number of companies were represented by members of their environmental staffs. However, I did not learn very much of value to the report I was preparing to write for COPE. In fact, I was amazed by the approach which had been taken by the organizers of the conference and by the atmosphere which prevailed at it.

In the first place, only rarely did any of the scientists involved make any attempt to relate the state of knowledge in their disciplines to oil and gas developments which were already underway, or, in the offing. When I attempted to do this in the question periods, I encountered hostility and inadequate answers. The scientists present wanted to talk about permafrost, pingos, scours in the sea floor, winds and currents, but did not want to attempt to relate what they knew to what was about to happen. In addition, no time was allocated in the program for applied discussions of this nature. The approach to the organization and conduct of the symposium would have been appropriate if it had been held a decade earlier, but





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was inappropriate considering the situation which existed at the time. All fall I had been running into blank walls in the search for information on offshore drilling from official government and industry sources. In retrospect, it seemed to me that even independent scientists, who should care about the Beaufort Sea, had become part of a conspiracy of silence on matters of great import to the future of a vital part of the Arctic Ocean and to native people who depend on its resources. I might say, in retrospect, with the -- I was quite amused at the reading into the record of Mr. Horsfield's letter to Mr. Sam because I received very much the same treatment at the Beaufort Sea Symposium from people who were technical -- technically involved in offshore drilling, <sup>who</sup> assured me that they sympathized with what I was doing but it would be wonderful if I could just learn enough about it so I could ask questions that had some meaning.

Q In your opinion, Dr. Pimlott, how adequate was the scientific knowledge base in the early 1970's with regard to offshore exploration?

A In 19 -- 1973 was the year <sup>the</sup> that Department of Indian and Northern Affairs gave Imperial Oil approval to drill from Immerk and Cabinet gave approval in principle for offshore drilling in deepwater areas of the Beaufort Sea.

As a basis for those decisions, it was totally inadequate, so much so, that it is apparent that environmental considerations could not have been an important component in the decision-making



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process. In the question section on one of the sessions of the Beaufort Sea Symposium, I asked the panelists to provide an assessment of the adequacy of scientific knowledge in their disciplines to support the development of petroleum resources in the sea. I suggested that their responses be based on a scale of one to ten, with one representing a rudimentary state of knowledge and ten representing a situation where environmental impact assessments could be formulated without further research. The panelists were very reluctant to discuss the state of knowledge in such terms. However, one member of the panel finally responded by saying that in terms of similar bodies of water in the southern areas of the continent, knowledge of the Beaufort Sea stood at about an 1890 time base.

Subsequently, in private discussion, I asked a number of the scientists to respond; in only one instance was the state of knowledge rated higher than two on the scale I had proposed. Subsequently, in my review of research I found much evidence that indicated that when those decisions were made, knowledge of the Beaufort Sea environment was indeed rudimentary; in most cases at square one on the one to ten scale <sup>that I</sup> mentioned earlier. Let me give one example for a vitally important area. The knowledge of winds, waves and storms in the Beaufort Sea.

Part of APOA Project 13 was a hindcast study of waves and wind conditions in the Beaufort Sea. And I might say that Project 13 had to do with developing the background knowledge that was



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1 necessary for the design of drilling -- a drilling  
2 system for the sea.

3 THE COMMISSIONER: Excuse me,  
4 what's "hindcast study"?

5 A It's when they attempt  
6 to use data of a theoretical nature on which to  
7 make forecasts for the future. There were no actual  
8 data and so they attempted to use data that was not  
9 obtained from observation -- direct observation, but  
10 theoretical data based on meteorological conditions were  
11 -- which prevailed in the area. They refer to this as  
12 "hindcast studies". Imperial Oil also had a hindcast  
13 study done also on the same topic as partial support  
14 for it's artificial island building program.

15 There's rather an interesting  
16 thing about the Imperial study. It was referred to in  
17 this article that Imperial sent me. It said that they  
18 had not -- that the conditions which they had encountered  
19 in the building of Immerk were much more severe than had  
20 been indicated by the hindcast study. That reference  
21 is from the paper that I referred to. "How Imperial  
22 Built the First Arctic Island" but J. G. Riley of the  
23 field services of Imperial Oil Limited and it occurred  
24 in the Petroleum Engineer in January, 1974.

25 DINA's position paper on off-  
26 shore drilling stated that the winds were calculated  
27 from weather maps and the waves calculated from those  
28 winds and fetches, since wind measurements were practically  
29 non-existent. In other words, the design for the  
30 drilling system for the Beaufort Sea had to be based on





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1 theoretical data for wind forces and wave characteris-  
2 tics, since no actual data were available for offshore  
3 areas.

4 One of the things that was  
5 brought out at the Beaufort Sea Symposium was that it  
6 is simply not a reliable thing to do to make forecasts  
7 for conditions at the sea based on the nearest land  
8 bases, that the situations can vary some much over a  
9 body of water of the magnitude of the Beaufort Sea,  
10 that there's very little realism that can be gained  
11 from that and I suppose that is attested to the fact  
12 that theoretical data based on weather charts were  
13 used.

14 Q Dr. Pimlott, turning to  
15 the next question, could you tell me what was done to  
16 interpret existing knowledge so that it could be  
17 related to the decision-making process involved  
18 in offshore drilling from artificial island and drill  
19 ships?

20 A On August 13, 1971, Imperial  
21 Oil submitted an application to construct its first  
22 artificial island, Immerk. The application was  
23 supported by a number of documents including a report  
24 that was titled "Offshore and Tidal Flat Artificial  
25 Island Construction, Mackenzie Delta -- Beaufort  
26 Sea". This is also available as an appendix document  
27 to my testimony. The report contained four sections.  
28 A: The Environment, B: Offshore Island Construction,  
29 C: Exploratory Drilling Operations, D: Environmental  
30 Impact. The report was nineteen pages long. All





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1 information on the environment and on environmental impact  
2 resulted from existing reports and maps. It did not  
3 contain any data that were credited to the studies  
4 conducted by, or for, Imperial Oil. In fact, the  
5 bibliography listed only one report on animals or  
6 plants that was specific to the area. The single  
7 reference to it indicated that it was of minor import-  
8 ance.

9 The statement on environmental  
10 impact which it contained was without scientific  
11 merit and valueless in terms of the subject it dis-  
12 cussed. In four pages on the marine environment,  
13 the discussion considered what effect oil operations  
14 may have under the following headings: thermal changes,  
15 changed selenites , chemical effects, denudation of  
16 the bottom, hydrocarbon spillage, sediment dispersion,  
17 noise and traffic.

18 The environmental impact of  
19 hydrocarbon spillage was dealt with under two headings:  
20 1. Offshore Island Construction. There it said that  
21 "Hydrocarbon spillage during this part of the operation  
22 would have as its only source, fuel or lubricating  
23 oils. Proper operating practices during fuel transfer  
24 operations must be relied on to ensure no spillage  
25 occurs". 2. And this other heading, "Exploratory  
26 Drilling Activity" and this, of course again, is  
27 referring to the hydrocarbon spillage. There it said:  
28 "The most potentially serious problem that could  
29 arise would be a massive hydrocarbon spillage associated  
30 with a blowout. As pointed out in Section C, all



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1 operational precautions will be taken to prevent the  
2 occurrence of blowouts." Three paragraphs of equal  
3 scientific stature dealt with the advantages of  
4 artificial islands if blowouts occurred and one  
5 other stated what the company was doing about the  
6 development of a contingency plan.

7 In summary, the serious in-  
8 adequacy of the report, and in particular, the  
9 section on environmental impact, supports my earlier  
10 statement that environmental considerations could not  
11 have been an important component in the decision to  
12 approve construction of and drilling from Immerk.

13 The second thing, in the case  
14 of the Cabinet decision to give approval in principle  
15 to drilling in deepwater areas of the Beaufort Sea,  
16 I believe I reviewed all important internal government  
17 documents and I was in a position to make a fairly  
18 direct assessment. The documents reviewed included  
19 the proceedings of the Northern Canada Offshore Drilling  
20 meeting, the position paper on Oil and Gas Exploratory  
21 Drilling in the Offshore Region of Canada's Arctic, and  
22 the draft memorandum to Cabinet on offshore drilling.

23 In terms of the question asked,  
24 the position paper was the most definitive document.  
25 It reviewed the state of knowledge and its application  
26 in very general terms. It is clear from it that no  
27 attempt was made to formulate an environmental impact  
28 assessment prior to Cabinet consideration. This con-  
29 clusion is borne out by a memorandum from a special  
30 assistant to the Minister of the Environment to the



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1 Deputy Minister of the Department and the memo was  
2 written ten days after the Cabinet had given approval  
3 in principle to offshore drilling. The memorandum,  
4 about a proposed Environmental Impact Assessment  
5 project for the Canadian Environmental Advisory Council  
6 stated in part, and I quote:

7 "Another point the Minister raised in his telephone  
8 response to this letter was that you bear in mind  
9 the recent Cabinet approval of the oil drilling  
10 in the Beaufort Sea paper. This approval for the  
11 granting of permits to drill, has been given with-  
12 out enough time to do proper environmental assess-  
13 ment work. If the Council knew that we were about  
14 to go ahead with this work and had their environ-  
15 mental model handy we could all end up caught in  
16 the glue".

17 Their memorandum was dated  
18 August 10, 1974 from Miss Diana Pethick, Special  
19 Assistant to the Hon. Jack Davis, Minister of the  
20 Environment and it was directed to Mr. Shaw,  
21 who was then Deputy Minister.

22 Q What do you know about  
23 industry's environment impact assessment for Immerk?

24 A Well, the 1972 study which  
25 was sponsored or contracted by Imperial Oil was under-  
26 take to assess the impact of the construction of Immerk  
27 and was done concurrent with construction. It's sole  
28 purpose was to deal with the environmental impact of  
29 construction of the island. F. F. Slaney conducted  
30 the study and Mr. Robert Webb, the chief ecologist for





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1 Slaney made that point very clear in his letter of  
2 transmittal. And he said:

3 "According to our terms of reference, both the  
4 study aspect of the project and the environmental  
5 statement have dealt specifically with the matter  
6 of construction of the artificial island Immerk,  
7 along with directly associated activities.  
8 Eventual disposition or use of the island in any  
9 way, such as drilling for hydrocarbons, was beyond  
10 our terms of reference to consider."

11 The study was done after Imperial had submitted and  
12 had its application to construct the island approved.  
13 I was required by DINA, I believe, as a result of a  
14 recommendation by the Land Use Advisory Committee.

15 Q What does the Land Use  
16 Advisory Committee's handling of the Immerk case  
17 indicate about its effectiveness?

18 A First, I must say that I  
19 have not seen the minutes of the meetings of the  
20 Committee in which the application for Immerk was  
21 considered and acted on. However, it is possible to  
22 make at least a partial assessment on the basis of  
23 what did evolve in terms of Immerk. As I mentioned  
24 earlier, Immerk was a landmark case. It was the first  
25 move to a new exploration frontier in the Arctic Ocean.  
26 The opening of this frontier was based on very inadequate  
27 environmental knowledge and on oil-spill technology  
28 that was not even adequate to deal with major spills in  
29 benign southern environments. In spite of this, the  
30 only requirement made of Immerk was that it have an



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1 environmental impact assessment made of the effects  
2 of the construction of the island. Imperial was  
3 allowed to draw terms of reference for the study so  
4 that drilling for hydrocarbons was excluded; in other  
5 words, so that the study could not deal with the  
6 environmental impact of oil spills -- a consideration  
7 which was of paramount importance to Mackenzie Bay.

8 This clearly indicates that  
9 there were deficiencies in the environmental monitoring  
10 process associated with the application of the Land  
11 Use Regulations. However, I cannot judge whether the  
12 inadequacy that existed in the handling of Immerk  
13 occurred at the level of the Committee or higher  
14 up, as a result of recommendations made by the  
15 Committee having been ignored by the administrative staff  
16 of the Department of Indian and Northern Affairs.

17 Q What do you know about  
18 the geological formation pressures which were  
19 encountered at Immerk?

20 A Perhaps, before I answer  
21 the question, I would just say that my first knowledge  
22 on geological formation pressures came from an article  
23 which was occurred in "Oil Week" on December 4, 1971.  
24 It said, it's title was "Geopressure Zones Throw  
25 Challenge to Drillers in Three Canadian Plays".  
26 Perhaps those who don't know, the oil company used  
27 the word "play" to describe a theater of operation.  
28 Now, to the question.

29 The occurrence of abnormal  
30 formation pressures is a topic about which very little



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1 has been said by the petroleum companies who are  
2 exploring in the delta. Little or no information  
3 is made public about the occurrence of abnormal  
4 pressure in cases where they have been controlled and  
5 the wells completed. However, limited information was  
6 made available about Immerk in December, 1973, because  
7 in that case, drilling had to be discontinued at  
8 8,883 feet instead of 15,000 which was the targeted  
9 depth of the well. Some explanation was necessary.

10 The statement, however, as  
11 quoted in newspapers, was very terse. And, a common  
12 one, I think it must have come from a Canadian press.  
13 It occurred in many papers, was that "The well will be  
14 abandoned because high formation pressure precluded  
15 further safe drilling". In March, 1975, Mr. R. N.  
16 Daw, of Imperial Oil, presented a paper to the Canadian  
17 Society of Petroleum Geologists on the detection and  
18 control of overpressure. "Oilweek" reported on his  
19 talk in an article entitled "Mud, Weight Control in  
20 the Delta". The article included two sets of graphs  
21 from Mr. Daw's paper. One of these "Immerk Velocity  
22 Plot", showed that the company had anticipated that it  
23 would encounter abnormally high pressures at approximate-  
24 ly 7,600 feet.

25 However, I found evidence that  
26 indicated that Imperial Oil had provided misleading  
27 information on pressures in making application to drill  
28 Immerk. In support of its application to drill, Imperial  
29 submitted and Arctic well contingency plan -- Immerk  
30 B-48. This is the copy of the Immerk contingency plan.





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1 Section 1330 dealt with preplanning for emergencies  
2 and contained a paragraph on formation pressures.  
3 The first statement that Imperial -- the first  
4 statement -- the first sentence stated what Imperial  
5 expected to encounter in drilling Immerk. It stated:  
6 "Analysis of available velocity data indicates that  
7 pressures above a depth of 10,000 feet will be normal  
8 and equivalent to a salt water gradient."

9                   There was some discussion of  
10 that matter yesterday and since preparing my testimony,  
11 I've received from the Department of Indian and  
12 Northern Affairs, the copy of Mr. Dow's paper in which  
13 he refers directly to this topic. If I might have, I'd  
14 like to -- rather than to quote the -- to leave the  
15 quote with the quotation from Imperial Oil article,  
16 I think it would be better if I could read it directly  
17 from the paper. It says "Prior to drilling Immerk  
18 B-48, we suspected overpressure from our seismic data.  
19 We tried to judge the depth and severity from a  
20 velocity plot, figure one. A plot of seismic transit  
21 time, versus depth, over a background of compaction  
22 curves. The background curves are plotted in pounds  
23 per gallon mud weight equivalent for pressure. These  
24 curves were derived empirically from Gulf post data  
25 at the time we knew they intended<sup>to</sup>/underrate Beaufort  
26 conditions. Transit time normally decreases with  
27 depth. Overpressure shales, however, are less dense  
28 and consequently have longer transit times. From this,  
29 Immerk's velocity plot overpressure was estimated at  
30 minus 7600 feet and was expected to be severe. A





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1 A rapid increase to at least 16 pound per gallon for  
2 pressure equivalent so a pressure monitoring program  
3 was a necessity."

4 Then, later on in the article,  
5 in the final stages they went on to say that it turned  
6 out that the conditions they actually found were fairly  
7 close approximations of those they had predicted. They  
8 did, however, run into conditions where they had to --  
9 required mud weight of an 18-pound pressure and it  
10 was at this point that they found that the conditions  
11 precluded further safe drilling.

12 To return to my testimony,  
13 my prepared testimony. In my opinion, it is significant  
14 that in the case of Immerk, which set a precedent for  
15 offshore drilling from artificial islands that the  
16 Land Use Advisory Committee did not have adequate  
17 information on the existence of a situation which  
18 results in particularly hazardous drilling conditions.  
19 Tuktoyaktuk Hamlet Council also deliberated the pros  
20 and cons of the application and made its decision to  
21 approve it without knowing that abnormal formation  
22 pressures existed with increased the risk of a blowout  
23 occurring during the drilling operation.

24 The whole question of abnormal  
25 geological pressures and the nature of the problems  
26 associated with them, should be clarified for the  
27 benefit of the people of the delta and the Beaufort  
28 Sea. According to "Oilweek", much of Imperial's  
29 acreage may be involved and this is an area of the  
30 delta and Beaufort Sea that is of critical importance  
to native people.



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1 Q In referring to the  
2 proposed Beaufort Sea Research Project in the COPE  
3 Report, you stated the opinion that a research program  
4 of one-year's duration was a waste of money. That was  
5 two years ago and the research program has been com-  
6 pleted. What is your opinion on the value of the Beau-  
7 fort Sea Research Project at this time?

8 A Before assessing the  
9 adequacy and value of the project, I would like to  
10 reflect back on some of my earlier comments on which  
11 I attempted to bring out how little was known in 1973-  
12 74 about the Beaufort Sea and its ecosystems. At that  
13 time I argued that a 3-year research program was the  
14 minimum time needed to obtain the knowledge required as  
15 background to the formulation of environmental impact  
16 assessments for exploratory drilling operations and  
17 to develop oilspill technology that would have even a  
18 marginal capability of dealing with blowouts in the  
19 Beaufort Sea. The approach to the Beaufort Sea  
20 Research Project raises many questions about scientific  
21 research and its application to the assessment of  
22 potential environmental effects of major projects,  
23 such as offshore drilling in the Beaufort Sea. Two of  
24 the important ones are: How valuable is the knowledge  
25 gained through crash catch-up programs of baseline  
26 ecological research? Is it valid and realistic to pre-  
27 pare environmental impact assessments for areas with  
28 highly variable environments on the results of research  
29 programs which have spanned only one or two seasons?  
30 Environmental conditions vary so much from year to



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1 year that it is difficult to accept that studies of  
2 less than three years' duration could produce the  
3 understanding needed to minimize the impact of a  
4 major petroleum exploration program.

5                   The kinds of problems  
6 which can be encountered in Arctic marine research  
7 programs were illustrated by ice conditions in the  
8 Beaufort Sea in 1974. Initial planning was for inten-  
9 sive research during an open-water season of two and a  
10 half months. However, as it turned out, 1974 was the  
11 year when summer virtually did not come to the Beau-  
12 fort Sea. The research vessels, the motor vessel  
13 'Theta' and the motor vessel "Pandora" were escorted by  
14 the icebreaker "Camsell" through the Bering Straits  
15 and into the Beaufort Sea. They did not arrive at  
16 Herschel Island until August 9, three weeks later  
17 than expected.

18                   The heavy ice conditions  
19 forced cancellation of some studies and allowed only  
20 limited progress to be made on a number of others.  
21 Little progress was made on near bottom currents and  
22 offshore tides (Project Number D2) or on open water  
23 surface currents (Project Number D3). The placing  
24 of offshore instruments for the automatic recording of  
25 data on currents and tides was part of the plan for  
26 D2; five were placed in November, 1973 and 19 in  
27 May, 1974. When the work to recover the instruments  
28 was started in August only one location was ice free.  
29 The gauges had to be, had been displaced by ice. Two  
30 weeks later they were accidentally found six miles





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1 away in the course of a helicopter flight for another  
2 project. Many of the gauges were not located during the  
3 season. The study of open water surface currents (D3)  
4 was forced to abandon its original plan and restrict  
5 efforts to nearshore currents in the Mackenzie and Kug-  
6 mallit Bays and in the vicinity of Atkinson Point.

7  
8 Much of the work on the  
9 use of the Beaufort Sea by waterfowl and sea birds was  
10 restricted to a relatively small patch of open water  
11 north of the Tuktoyaktuk Peninsula. One of the  
12 biologists told me that was probably the most  
13 intensive patch of water that had ever been studied  
14 in North America. At no time did the area of open  
15 water extend to the sites which will be occupied by  
16 the drill ships which are to be operated by  
17 Canadian Marine Drilling known as Canmar.

18 It is also important to  
19 recognize that the Beaufort Sea Project had important  
20 constraints other than those of time. According to  
21 the Project Leader Allan Milne, it was concerned only  
22 with the southeastern part of the Beaufort Sea and  
23 dealt only with the impact of the exploratory drilling  
24 phase of offshore oil operations. In more specific  
25 terms its results will relate only indirectly to the  
26 production and transportation of oil and gas from either  
27 deepwater or near shore wells and they will not provide  
28 much insight on the potential impact of oil spills on  
29 other parts of the sea or of the Arctic Ocean. These  
30 are serious deficiencies.



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1 I have not seen the  
2 final reports for the individual research projects so  
3 it is difficult to assess the results. However, the  
4 preliminary reports on fish, as an example, indicated  
5 that the nearshore areas are very important to fish but  
6 they fell far short of providing the detailed informa-  
7 tion on the various stages of life histories of the  
8 species which should be available for the formulation  
9 of an environmental impact assessment.

10 However, I must admit  
11 that now I consider that the Beaufort Sea Project  
12 was worth doing. The preliminary reports convinced me  
13 that a crash research program was better than no  
14 research at all.

15 Some insight on the poten-  
16 tial adequacy of the Beaufort Sea Project however  
17 is gained when it is compared with the research program  
18 which is being developed prior to the commencement of  
19 offshore drilling in Alaskan waters. And I am referring  
20 in Alaskan waters, I am referring principally to the  
21 Beaufort and the Chukchi Seas.

22 And there have been no offshore leases as yet in that  
23 area and Mr. Hnatiuk, the assistant manager of the  
24 Beaufort Sea Project said about that research that:

25 "Preliminary cost estimates are \$54 million for  
26 a two to ten year program and to be coordinated  
27 by the U.S. (National) Science Foundation.

28 A second \$28 million program for U.S. Arctic  
29 waters commenced in the spring of 1975, and  
30 will be coordinated by the U.S. National Ocean



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1           and Atmospheric Administration."

2           I now have most of the documents of, from these  
3           organizations.

4                           THE COMMISSIONER:   Excuse  
5           me, Mr. Pimlott.   The, no permission has been given  
6           to drill offshore by Alaska or by the United States in  
7           the Beaufort Sea, not even in the immediate offshore  
8           area?

9                           A       No, in the, I am not  
10          exactly clear of how that works in the immediate  
11          Prudhoe Bay area and there was some, I was referring  
12          principally to the U.S. which has the principal  
13          offshore outer O.C.S. -- the Outer Continental  
14          Shelf Program.   And the, an article in the recent  
15          publication of the Alaskan Conservation Society  
16          describes the present state and they say that the  
17          leasing program is to begin somewhere about, I believe,  
18          the end of 1976 and will be spread quite rapidly over  
19          the sea.   The Alaska Government, I believe, has  
20          decided to give some leases   in the very shallow  
21          water areas off the Beaufort Sea that are fairly close  
22          to Prudhoe Bay and in those areas, they appear to  
23          be trying to develop       another form of ice island  
24          and this is one in which an ice island would be  
25          constructed and frozen to the bottom and I believe  
26          this is done partly through a refrigeration method  
27          so that it is an ice island, is maintained throughout  
28          the summer; but I just learned today from Miss Noble  
29          who has been in contact with the North Slope region  
30          that that has been reviewed and has been turned down.



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1 So I think it is correct to say that there has been  
2 no new programs beyond those that were in the  
3 immediate Prudhoe Bay area and certainly they're  
4 miniscule in terms of if they do exist, in terms of  
5 the total area of the Chukchi and the Beaufort Sea.

6 THE COMMISSIONER: Chukchi  
7 lies offshore of Alaska and Siberia. Is that correct?

8 A Yes. To sum up, I would  
9 argue that the Beaufort Sea Project should be viewed  
10 as the preliminary phase of an extensive program of  
11 research in the Beaufort Sea. In my view, such  
12 research should have two phases: The first would be  
13 a carefully developed long-term program of basic  
14 research on biological and physical aspects of  
15 the Beaufort Sea environment. And I must, I would  
16 like to add to that that I believe that this type of  
17 basic sea research or basic research needs to be a  
18 coordinated type of research. I believe that in terms  
19 of the rate of movement of development in the Arctic  
20 we can't return to the <sup>1</sup>ad hoc way of anticipating from  
21 general science research, natural science research  
22 programs that we would get through information that  
23 was needed on which to base extensive development  
24 programs so I tend to think that the basic approach  
25 of the Beaufort Sea Project will have to be applied  
26 over a long term. The second area that I think is  
27 important but there is also a need for a more specialized  
28 environmental impact research program. The highest  
29 priority would be a research which is designed to  
30 identify or predict potential problems which could





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1 result from the various stages of petroleum development.  
2 One aspect of the research would involve environmental  
3 studies and monitoring of ongoing projects. The  
4 objectives of this program would be to determine what  
5 can be done to adapt exploration and production activi-  
6 ties and methods in order to reduce the potential for  
7 environmental damage which now threatens from  
8 industrial development. Both programs should be  
9 developed immediately.

10 I think that in some of  
11 these areas that it is sometimes possible to have  
12 their cake and eat it too. That if you have enough  
13 understanding of this environment, you can sometimes  
14 phase activity so that they do not occur at these  
15 critical times, at critical times but you must have  
16 a very thorough understanding of the environment and  
17 of the way the animals are using it to be able to  
18 adapt research programs to conditions which exist and  
19 I don't think that that kind of information is  
20 available for the Beaufort Sea yet.

21 Q In your opinion, are  
22 there any particularly important weaknesses in the  
23 processes involved in considering and granting  
24 approval for the construction of artificial islands and  
25 in granting authority to drill from them?

26 A The fact that potential  
27 cumulative effects appear not to be considered seems  
28 to me to be a very important weakness. As I understand  
29 it, the terms of reference of the Land Use Advisory  
30 Committee result in it considering and acting on each



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land use application for artificial islands as if it was one of a kind rather than one of an expanding series. The possibility that the construction of artificial islands might influence white whale migration has been a major concern of native people. The whales must have open water available to move from area to area, hence preservation of the distribution of open leads is important during breakup or during periods when the ice is on the move. It would seem possible that the presence of increasing numbers of artificial islands could change the distribution of leads during the critical periods when the whales are migrating to areas where their young are born. Similarly, the potential cumulative effects of the dredging program for island construction may warrant consideration. The near-shore region of the sea contain many rearing and feeding areas for fish stocks which are utilized by native people. Are there any important ones in the areas where islands are being built? If so, are they being affected by the building of islands? To sum up, I consider that the licensing process should be required to consider potential environmental consequences of the island-building program on fish and whales rather than just the effect of individual islands.

And recently I was privy to a copy of the Land Use Advisory Committee meeting which discussed the construction or the application for the construction at Issigak and Ernak and the construction specifically focused around this topic or part of the construction / specifically focused around this



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1 topic and one member re-emphasized and in it said  
2 the importance of a study of the long-term effects of  
3 these islands --

4 THE COMMISSIONER: Excuse  
5 me, one member of what said ?

6 A Of the Land Use  
7 Advisory Committee which makes the recommendations  
8 to Indian and Northern Affairs and he pointed out that  
9 they couldn't ascertain the effect that islands would  
10 have on the whale movements. The whales normally  
11 used an open lead to move in and thus the islands  
12 could have serious effects during the period of  
13 heavy ice movement. And there have been other  
14 discussions in the committee that indicate members of  
15 the committee themselves feel that their terms of  
16 reference with respect to cumulative effects should  
17 be or should be included in their terms of reference.

18 Q In your review of  
19 Imperial Oil's Report submitted with the application  
20 to construct Ernak you dealt particularly with the  
21 environmental impact of hydrocarbon spills. Is there  
22 any aspect of that question which warrants particular  
23 emphasis in offshore operations?

24 A The one that has  
25 weighed on my thoughts most is the length of time  
26 that would probably be required before a relief well  
27 could be drilled to stop the flow of oil should a  
28 blowout occur. In the case of drill ships, the operat-  
29 ing season in the Beaufort Sea could range from a  
30 month to possibly four months in duration. If a





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1 blowout occurred much beyond the midpoint of even a  
2 long season, there would be little possibility that it  
3 could be stopped by drilling before the next drilling  
4 season which would probably be just eight to ten  
5 months away. If severe ice conditions occurred during  
6 the summer, as in 1974, it could be two years before  
7 a relief well could be drilled and a blowout stopped.  
8 In the case of islands in very shallow water, the  
9 time required would probably be considerably shorter  
10 since island building operations can be conducted in  
11 both summer and winter but there is little likelihood  
12 that an island could be built and a well drilled in  
13 less than four months even under optimum conditions.  
14 Under less than optimum conditions, say for example,  
15 where operations were delayed by the break-up or  
16 freeze-up of the ice, the time required could be  
17 almost doubled. Then, of course, I should point out  
18 that the whole island building scene is changing.  
19 Imperial first considered building islands in  
20 water depths of up to ten feet. Now it has approval  
21 to build one, Issigak, in forty-two feet of water.  
22 And Mr. Horsfield said yesterday that they weren't  
23 going ahead with that in the immediate future but  
24 nevertheless they do have approval for it. That  
25 island would hire over a million cubic yards of sand  
26 and gravel and I would direct your attention to my  
27 prepared testimony there that it should be a million  
28 cubic yards of sand and gravel and will take two to  
29 three years to build and the, in the case of Immerk,  
30 the one off Tuktoyaktuk in 22 feet of water, 690,000



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1 cubic yards of gravel would be involved. Now, when  
2 you get to this amount of gravel that Issigak would  
3 take, this almost totals, that one island practically  
4 totals the amount that was used in the first five  
5 islands so the construction period, it said in the  
6 application that it would take two to three years to  
7 build. I am not sure that that would be constant  
8 work because they said they wished to make economic  
9 use of it but it is still a very very large amount  
10 of material and it is getting out very close to the  
11 shear zone of the ice and you <sup>can</sup> anticipate ~~there~~ <sup>would be</sup> longer  
12 breakup and freezeup periods out there than there is  
13 in the more sheltered areas. I do not know what the  
14 contingency plan for drilling a relief well is,  
15 however, unless a drillship can be brought into play,  
16 it is difficult to conceive of a situation which  
17 would permit a relief well to be drilled in less  
18 than a year. Some of the background statistics on  
19 island-building are given in a report prepared by  
20 Imperial Oil for the Land Use Advisory Committee. The  
21 applications for Imperial Issigak A-57 and Ernak I-21  
22 provide details on construction and drilling schedules  
23 as originally proposed before the company's new dredge  
24 ship "Mackenzie Beaver" encountered problems in reaching  
25 the Beaufort Sea. That is available as Appendix C.  
26 Those two are available as Appendix C of my testimony.

27 Q What did you learn about  
28 the level of technological development as represented  
29 by offshore drilling operations in the Beaufort Sea?

30 A Even to a non-engineer



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1 it is evident that only modest technological adaptations  
2 have been made to meet the increased difficulties of  
3 drilling in the Arctic. And I believe that was borne  
4 out by Mr. Horsfield's statement yesterday when he  
5 said basically it was that there wasn't much difference  
6 in the equipment that they used in drilling in  
7 the offshore areas than in other areas. The building  
8 of islands allows for a longer drilling season and  
9 apparently a more secure base against ice pressures,  
10 but an island does not meet the needs of an Arctic  
11 environment if a blowout occurs. The support for this  
12 statement is evident from the answer to the last  
13 question. And again referring to Mr. Horsfield's  
14 testimony yesterday, there has never been any  
15 reference in any documents that I have--and I have  
16 studies many of them from Imperial Oil--which suggested  
17 that there was any possibility that a relief well  
18 could be drilled from the island where a blowout  
19 occurred.

20 Frequent mention is  
21 made by members of the petroleum industry about the  
22 fact that the drillships will be used in the Beaufort  
23 Sea, that the drillships which will be used in the  
24 Beaufort Sea are ice-strengthened. However, it  
25 is evident that this adaptation is required for even  
26 summer drilling operations in the Beaufort Sea. (This  
27 is illustrated by the fact that the hull of Imperial  
28 Oil's new ship-dredge, the "Mackenzie Beaver", was  
29 damaged this year or last year in trying to get into  
30 the Beaufort Sea to add to Imperial's island building





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1 fleet). The strengthening of the hull adds very  
2 little to the capability of the ship to lengthen  
3 the drilling season since there would be very little  
4 possibility of it drilling more than four months  
5 even during the most favourable season. And in fact,  
6 the approval in principle which is per given Canmar  
7 by the Department of Indian Affairs and Northern  
8 Development specifically specifies that the drilling  
9 season must not be more than 120 days long. This  
10 hardly represents technological developments of  
11 drilling systems which are adequate for use in the  
12 Arctic.

13 The development of  
14 technology which would permit systems to face  
15 Arctic conditions on more equal terms has been the  
16 subject of considerable discussion. There were papers  
17 on the topic at the Northern Canada offshore drilling  
18 meeting<sup>and</sup> in 1972, at an International Congress in  
19 France in 1973, and there have been a series  
20 of recent papers in the petroleum press during the  
21 past year. Mr. Brown of Sinoco reviewed the  
22 Canadian situation also at the Beaufort Sea  
23 Investigators Conference and I have a copy of his  
24 paper available. However, the thing that appears quite  
25 clear is that there is little likelihood of dramatically  
26 new systems coming into use in the Beaufort Sea before  
27 the 1980's and even this applies only to areas within  
28 the shorefast ice zone.

29 In 1973, approximately  
30 three months before Cabinet gave approval in principle





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1 to the operation of drill barges in the Beaufort Sea,  
2 an official of Shell Oil gave an indication of the state  
3 of technology and this paper was given at the  
4 conference at France in the spring of 1973, and he  
5 stated that:

6 "Although a large amount of literature has  
7 been published on and about the Arctic, design  
8 engineers have found little useful data per-  
9 taining to ice strength, ice movement, ocean  
10 floor conditions and other environmental  
11 factors that will affect work in the Arctic  
12 offshore waters and are required for the  
13 determination of the basic design criteria."

14 Q In the COPE report  
15 and again just now, you referred to the use of drill  
16 barges in the Beaufort Sea. Is drilling not to be  
17 done from the drillships rather than drill barges in  
18 your opinion?

19 A Until 1974 all dis-  
20 cussion centered around the use of drill barges and  
21 the COPE report was based on the fact that we antici-  
22 pated that drill barges would be used. There were  
23 two papers on them at the Northern Canada Offshore  
24 Drilling Meeting; they were the basis for DINA's  
25 position . paper on "Exploratory Drilling for Oil  
26 and Gas" and for the Cabinet memorandum on offshore  
27 drilling. A lot was made of the fact that studies  
28 sponsored by the Beaufort Sea Task Force and Hunt  
29 Petroleum had arrived at independent conclusions which  
30 favoured the use of a barge drilling system.



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1 The position paper on offshore drilling stated that the  
2 proposed systems were satisfactory and a barge system  
3 was recommended to Cabinet. But throughout this  
4 period the possible use of drillships was not brought  
5 out into the open. Dome Petroleum was represented  
6 at the Northern Canada Offshore Drilling Meeting but  
7 did not mention any plans for the use of drillships  
8 in the Beaufort Sea. However, in March, 1974, when  
9 Mr. Chretien stated publicly that approval had been  
10 given for the construction of a drilling system for  
11 the Beaufort Sea, it became evident that the whole  
12 game plan had changed; approval had been given to  
13 Dome not to Hunt or to the Beaufort Sea Task Force  
14 and to a drillship system, not to a drill barge. I  
15 did not learn why the sudden shift had occurred. If  
16 barges represented an adequate system in July, 1973,  
17 when the concept was approved by Cabinet, why was  
18 the concept discarded within a few months?  
19 And I have never been able to gain any understanding  
20 of what happened there.

21 Q Do you have any other  
22 concerns about the use of drillships in the Beaufort  
23 Sea?

24 A Yes. As far as I have  
25 been able to learn no assurance has been given that  
26 the two drillships will be tested in less  
27 rigorous environments before they begin operations in  
28 the Beaufort Sea. The Department of Energy Mines and  
29 Resources has a policy that no system will be used  
30 for the first time in Arctic waters which come under



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1 its jurisdiction. I consider that the same policy  
2 should apply to the Beaufort Sea. Since a blowout  
3 could take up to two years to stop, it is not a  
4 suitable place for the testing of equipment or for the  
5 training of crews.

6 Q What did you learn about  
7 possible methods of producing oil and gas from wells in  
8 the Beaufort Sea?

9 A As a double preface to  
10 this, I must call attention to the fact that I am an  
11 ecologist, not an engineer and that we tried to investi-  
12 gate this because we felt it was part of the perspective  
13 that was needed and in this work, I was assisted by  
14 Mr. Kenneth Sam who worked with the Northern Assessment  
15 Group for part of the time and for COPE part of the  
16 time, and he prepared a report of production systems.  
17 I reviewed it and reworked it and it became part of  
18 the book which we are to publish in which Mr. Sam  
19 is a co-author.

20 So as the other preface  
21 to my reply, I should say that the Beaufort Sea  
22 environment is very different from the Gulf of Mexico  
23 or from Cook Inlet in Alaska. Arctic pack ice would  
24 destroy any production platform that is now used in any  
25 of these areas. In such areas, these fixed platforms  
26 are being built in waters that are over 800 feet deep.  
27 However, it would seem that subsea completions (which  
28 involve placing the wellhead on the ocean floor) and  
29 subsea production facilities (which operate automatically  
30 and which can handle a series of wells) are potentially





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feasible for some areas of the Beaufort Sea. However, ice scouring will pose a threat to such facilities in waters from 35 to 150 feet deep. And I defer to Mr. Shearer on all matters pertaining to that and he discussed some of these in his testimony this morning.

The presence of undersea permafrost will also constitute a threat in some areas. However, it can be detected in advance.

Now, this whole question of subsea completions and most of the source of our information on this comes from this book called "Energy Under the Oceans" which is a technology assessment of outer continental shelf oil and gas operations and it was prepared by a group at the University of Oklahoma and it was under, sponsored by the National Science Foundation in the United States as one of the preparatory stages to an extension of offshore drilling developments in the United States. It is a very comprehensive book. Unfortunately, it does, it says very little about Arctic conditions but it still is a source of extremely great value to particularly non-professionals who are trying to gain an understanding of the problems.

Subsea completions are well advanced in terms of practical use. In 1973, more than 70 were in use in United States offshore waters. The state of development of subsea production system is not as advanced. In 1973 two prototypes were being tested under field conditions and another system was being designed. A subsea production system reported



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suitable for Arctic operation is being designed by Lockheed Petroleum Services and has been referred to in some of the petroleum-engineering magazines. Where artificial islands are being used for exploration, they will also probably be used for production. However, they will probably require more protection from the action of waves and pack ice. Imperial Oil recently made this statement about its production facilities and this was in a report that it submitted on request of the Land Use Advisory Committee and which I also have available here. They said in that report:

"All of our islands built to date have been designed only to support exploration wells. It is not intended that they be used as permanent structures. The method of construction for permanent islands is still in the planning stage. They will be designed to maximize the utilization of the exploration islands."

I found it a little difficult to understand because it said they will not be used as permanent structures and then they went on to say that they will maximize utilization of exploration islands so I am not quite certain whether they intend to use the sand <sup>in</sup> them as sand and gravel source or whether they intend to build them up by the use of riprap or some other method to strengthen them for construction or for production purposes.

As an alternative or perhaps as an addition to manmade islands Imperial has



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1 designed a conical monopod-like structure for use in  
2 ice-infested waters. The system has received approval  
3 in principle from DINA -- I said in my written testimony  
4 "has apparently received approval in principle from  
5 DINA" but in the paper that I referred to by Mr. Brown  
6 that was presented at the Beaufort Sea Investigators  
7 Conference last January, he said that it had received  
8 approval in principle from DINA. And though, as far  
9 as I know, no announcement has been made on the plans  
10 to construct the prototype and you will recall  
11 yesterday that Mr. Horsfield was very evasive on that  
12 particular question and it is one of the things that  
13 I have great wonderment about because a monopod, they  
14 say they can be ballasted in 12 hours and move it to  
15 a new site in 36 hours and if that is the case, it would  
16 seem to me extremely valuable and useful to have at  
17 least one monopod operating in the Mackenzie Bay so  
18 that at least in the offshore, in the open water season  
19 the monopod could be moved and to start almost  
20 immediately to drill a relief well. And I just have  
21 no, have not been able to get any understanding as to  
22 why is it not being more actively considered for  
23 immediate use because it would seem to have this  
24 great potential to serve in case of major accident  
25 occurring.

26 Q What did you learn about  
27 the transportation of oil and gas from offshore?

28 A Again, much of this work  
29 was work originally done by Mr. Sam and we collaborated  
30 on it but he did the greater part of the work. It





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appears that major advances must be made in technology in order to get oil or gas to shore. In other areas, transportation has been by pipeline or by tankers. However, it does not seem that tankers will be feasible in the Beaufort Sea. A feasibility study for an offshore pipeline in the Beaufort Sea is being conducted by the Arctic Petroleum Operators Association at a cost of \$75,000. According to APOA, the purpose of the study is:

"To determine the technical feasibility of installing pipelines offshore Mackenzie Delta to the 150' water depth contour. Estimates of installation costs are to be provided in order to establish economic feasibility. Lay-barge, pull, and reel-barge pipelaying methods are to be considered, limits of technical applicability for each area are to be established and problems identified. Thermal effects of the pipeline will be examined and adequate measures to prevent melting of any existing offshore permafrost will be considered. The study will analyze available scour information, evaluate risk and determine pipeline burial requirement and costs. Trenching techniques form an important aspect of the study. The project is essentially a feasibility study of Arctic offshore pipelines and not a detailed design for a specific line and route. Although certain specific factors in a specific area are being considered, the range of conditions in which a specific recommendation





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might apply will be given. The sensitivity of any recommended pipeline installation technique to change of conditions will be indicated."

In addition to potential problems from scouring and permafrost, surface ice will frequently make both maintenance and repair operations difficult or impossible. Technology is being developed which may eventually handle repair operations under land-fast ice, but repairing a pipeline under the polar pack and along the shear zone will be much more difficult to accomplish.

Canadian Arctic Gas Study Limited stated that limited access for maintenance of a pipeline presents serious operational reliability problems. It suggested that in water up to 20 to 30 feet deep, maintenance access might be extended to 7 to 8 months with the use of air-cushion support barges. And it stated,

"However, any type of repair during the break-up and freeze-up would appear not to be feasible even with the air-cushion support vehicle and submersible pipeline repair system."

And that reference --

THE COMMISSIONER: That is the offshore route?

A It is the alternate route.

THE COMMISSIONER: Offshore.

A Yes, the alternate corridors and system of transportation, section 14e, subsection 1-3, an exhibition in support of application



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to the Department of Indian and Northern Development  
of the Government of Canada for authorization to  
the  
use land to/ National Board of Canada, etc.

In summation, it is  
clear that the technology does not yet exist which  
can ensure that oil or natural gas can be transported  
to land without the environment being under constant  
stress from oil spills. In addition, I have not been  
able to determine that much is being done in advance  
of discoveries which would result in pressures for  
quick solutions to the large technological problems  
which are posed by the harsh physical environment.

Q Can you tell us what  
is known about spills of oil from production systems  
and underwater pipelines?

A To preface my written  
testimony, I would again like to refer to "Energy  
Under the Ice" and to the this publication O.C.S. --  
Outer Continental Shelf Oil and Gas and Environmental  
Assessment, a report to the President by the Council  
on Environmental Quality, April, 1974. It was  
another of the studies that was done to precede off-  
shore drilling and much of the information of our  
information on these spills was drawn from these two  
publications.

Q Dr. Pimlott, when you  
say "Energy Under the Ice", in reference to that first  
volume, I believe it is "Energy Under the Seas, the  
title to that.

A Yes, I am sorry.



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1 "Energy Under the Oceans". I am wrapped up in  
2 something else. Now to return to my written testimony.

3                   Spills during production  
4 and transportation remain a persistent, chronic problem  
5 in the development of offshore petroleum resources. In  
6 the Cook Inlet area of Alaska, there are 14 producing  
7 platforms, 13 oil and 1 gas, from which pipelines  
8 extend to the shore. In 1968, 26 spills occurred in  
9 the Inlet itself. Some slicks extended many miles and  
10 the industry estimates them to have involved more than  
11 1,000 barrels of oil. Five pollution incidents have  
12 resulted from a single pipeline installation. And this  
13 is based on a paper by Mr. C.D. Evans "Environmental  
14 Effects of Petroleum Development in the Cook Inlet Area"  
15 and the proceedings of the 20th Alaskan Science  
16 Conference in 1970 so it is somewhat dated but it was the

17       most the up-to-date information that I was able to  
18 get on the Alaska performance. In total, over 150  
19 pollution incidents were recorded in the Inlet from 1965  
20 to 1968. In November 1967, oil from an unknown source  
21 killed an estimated 1,800 to 2,000 sea ducks and other  
22 water birds.

23                   Now, the following infor-  
24 mation is from the Council of Environmental Quality  
25 publication. Three major spills have occurred from  
26 platforms in the Gulf of Mexico since 1969: And the  
27 quotation:

28       "In the Shell accident in 1970, estimates  
29 of oil loss ranged from 53,000 to 130,000  
30 barrels. The Chevron accident resulted in a





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loss of 30,500 barrels. Finally, the Amoco accident (1971) resulted in the loss of 400 to 500 barrels."

That is the end of the quotation. From 1964 to 1972 there were nine spills from offshore platforms in the United States which resulted in spills of more than 1,000 barrels of oil. The range was from 1,600 to 77,400 barrels. During the same period there were eight spills of over 1,000 barrels from pipelines. They ranged from 1,000 barrels of oil to one of 150,000 barrels. In offshore operations in the United States which were under control of the Federal Government from 1954 to 1971, one-eighth of a barrel of oil was spilled for every one thousand produced.

The authors of "Energy Under the Oceans", it should be, not "from," an extensive assessment of offshore technology in the United States concluded that each year, one in 3,000 production wells is involved in a major accident, that is, an accident which results in injury and property or environmental damage. There were 43 such accidents in outer continental shelf operations between 1953 and 1972. They resulted in 56 deaths and in spills which totalled between 290,000 and 1.1 million barrels of oil. The Council of Environmental Quality summed up the statistical chances of major spills occurring from platforms and pipelines for an oil field of medium size.

"There is about a 70% chance that at least one platform spill over 1000 barrels will occur during the life of the field. For a



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1 small oil field find, there is about a 25%  
2 chance of one platform spill<sup>of</sup> over 100 barrels,  
3 and for a large oil field find, there is  
4 over a 95% chance of a platform spill  
5 over 1000 barrels during the life of the  
6 fields. The probability of pipeline spills  
7 follows the general pattern exhibited by  
8 platform spill statistics."

9 And there, I might say, that in "Energy Under the  
10 Ocean", there are quite extensive data in the form  
11 of tables showing spills from many different  
12 characteristics and discussing comparative rates  
13 of spills from exploration and production from both  
14 land and offshore facilities.

15 THE COMMISSIONER: Dr. Pimlott,  
16 the Council on Environmental Quality is an official  
17 U.S. government body established under the Act of  
18 1969, as I understand it, when do they say this, and in  
19 what document does it appear?

20 A This is all in their  
21 Environmental Assessment of Offshore Outer Continental  
22 Shelf areas. The environmental assessment process  
23 for operations like this in the United States goes  
24 through a whole series of stages. This is one based  
25 on existing data. And then they go down --

26 THE COMMISSIONER: I understand  
27 their procedure but what is that blue book?

28 A Well, I cited--I read it into  
29 the record it's "Outer Continental Shelf -- O.C.S. --  
30 that's Outer Continental Shelf Oil and Gas and



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1 Environmental Assessment. A report to the President  
2 by the Council on Environmental Quality, April, 1974.

3 In discussing the oil  
4 spill problem in Cook Inlet, a U.S. scientist who was  
5 familiar with the development of the area, pointed out  
6 the fact that industry management "apparently desires  
7 to maintain a reputation for good citizenship by running  
8 a clean operation. Implementation of this desire at  
9 lower echelons is difficult, however." He also cited  
10 the problem of prosecuting offenders, because  
11 legislation requires that gross negligence be proved.  
12 The result was that only five of 150 incidents resulted  
13 in prosecutions. He also implied that the safety  
14 factors necessary to protect the integrity of oil  
15 production and transportation systems against unforeseen  
16 conditions were developed by trial and error instead  
17 of at the drawing board and he said:

18 "Five pollution incidents stemming from  
19 one pipeline in Cook Inlet have emphasized  
20 that we cannot afford designs that must be  
21 improved on as a result of repeated failures  
22 in the field."

23 The human factor as a cause of oil spill. is emphasized  
24 repeatedly in the literature, and it is illustrated in  
25 the statistics on the drilling of development wells.  
26 According to the Council of Environmental Quality,  
27 development drilling is generally less hazardous than  
28 exploratory drilling because the characteristics of the  
29 geological formations are better known. However, a  
30 survey of 32 wells which had blown out showed that





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65% of the wells had been development wells; because drillers act, apparently act with more caution on exploratory wells, and because of this there is an extra margin of safety which makes the difference.

And I might say that at the time that I was doing<sup>the</sup> background research on the chronic spills and production facilities, I made a trip down the Mackenzie River and stopped at Norman Wells and in fact, I picked up a canoe there and then went up-river but in picking up the canoe, I was quite interested in the proceedings because of this chronic problem and at the time about 9 <sup>o'clock</sup> / in the morning there was a steady flow of oil coming out between the barge and the dock and it was spreading out into a slick and then I tried to gain an understanding of what the relationship of the men at the site, who were working at the site to this loss of oil from some source and I found that they, in fact, had no sense of responsibility whatsoever for that and had no thought of reporting it to anyone, and I pursued it. I took a few hours to try to gain this understanding and went and talked to the manager of the N.T.C.L. -- the Northern Transportation Company and<sup>to</sup> the production manager of Imperial Oil and neither of them could explain this spill and there were no established procedures to take care or not to lessen the spill but it was a loss of oil of some kind. At the same time, I noticed that one of the valves at the dock was leaking, appeared to be diesel oil and was going down directly into a sump. So, I called this to the





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1 attention of the manager of the N.T.C.L. when he came  
2 down to the dock and he got a drip pan and put it  
3 under it. When we came back two hours later there  
4 was not very much oil in the drip pan and I said --  
5 I remarked that I thought the housekeeping was very  
6 poor around there. He said, "Well, I put a pan under  
7 that leak"; and I said, "Yes, but it is unfortunate  
8 that it had a hole in it that was just about the  
9 same size of the leak and so/<sup>it's</sup> not gaining very much  
10 oil." So, in fact it had gone on for another two  
11 hours and the leaking continued and it was just going  
12 almost directly through the pan and continuing into the sump.  
13 This presumably might have been part of the problem but  
14 it certainly came across to me very very clearly how  
15 difficult it is to get a feeling for the people who  
16 are actually working on the job and particularly in  
17 the situation where nobody has been clearly identified  
18 as having responsibility to whom they should report.  
19 At the same time on the bank there were a number of  
20 pieces of equipment associated with taking care of  
21 spills and so they were prepared to handle a major  
22 spill with booms and special boats but in this chronic  
23 area, there was this continual loss of oil in the few  
24 hours that I was there and it wasn't being dealt with  
25 at all. I suppose it is situations like this that  
26 result in the case of production facilities or at sea,  
27 it is said in the publications that the loss of oil  
28 is at least equal from things like this to the all of  
29 the loss that occurs from the larger accidents such  
30 as the ones we are referring here to as blowouts.



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1 Q Dr. Pimlott, how would  
2 you sum up your own personal feelings or conclusions  
3 about offshore drilling in the Beaufort Sea?

4 A In the first place, I  
5 consider it regrettable that plans for offshore  
6 drilling have been made in such an ad hoc way in terms  
7 of democratic political processes. In my opinion, the  
8 whole question of northern petroleum development should  
9 at least have been brought into national perspective  
10 by a government white paper so the complex social,  
11 political, economic and environmental issues could at  
12 least have been discussed and debated as part of a  
13 decision-making process. As far as I am concerned, the  
14 approach that has been used violates any reasonable  
15 interpretation of the statement of government policies  
16 on northern development in the 1970's. It also  
17 violates, again in my opinion, a reasonable interpreta-  
18 tion of the way that the development of non-  
19 renewable resources should be balanced with societal  
20 and environmental concerns and interests.

21 Dealing with offshore  
22 drilling in the Beaufort Sea specifically, I consider  
23 that it is a case where exploration of petroleum  
24 resources is being done at least a full decade ahead  
25 of the development of technology which <sup>should</sup> permit drilling  
26 systems to cope with the forces of the physical environ-  
27 ment with even modest capability. The same basic  
28 statement applies to the relationship between develop-  
29 ment and understanding of the Beaufort Sea environment.

30 In my opinion, the govern-



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1 ment is making a serious mistake in licensing offshore  
2 drilling operations in the Beaufort Sea now.

3 I do not consider that it  
4 is in the national interest to put at risk the natural  
5 resource base of northern native peoples and the  
6 Arctic environment in this way at this time.

7 MR. BAYLY: That is the  
8 direct evidence of Dr. Pimlott, sir, and he is  
9 available for cross-examination now but I am in your  
10 hands as to whether you want to adjourn that until  
11 tomorrow morning as I see it is quarter to five.

12 THE COMMISSIONER: Well, I  
13 think we will adjourn now until tomorrow then. What  
14 time should we start tomorrow in view of the fact we  
15 have a hearing tonight and we might want to --

16 MR. GOUDGE: I suggest 10 or  
17 10:30, sir.

18 THE COMMISSIONER: All right.  
19 Well, let's start at 10:00 in the morning then.

20 (PROCEEDINGS ADJOURNED UNTIL JANUARY 29, 1976)

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AUTHOR

28 Jan., '76.

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